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Reactive Plume Model--RPM-II: User's Guide

Systems Applications, Inc.
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REACTIVE PLUME MODEL -- RPM-II
User's Guide

by

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The Reactive Plume Model (RPM-II) is a computerized model used primarily for estimating short-term concentrations of primary and secondary pollutants resulting from point-source emissions. Two main features of the model are (1) its chemical kinetic mechanism, which explicitly solves the numerous non-linear chemical reactions associated with NO_x, ozone, and hydrocarbon cycles, and (2) the horizontal resolution within the plume, which offers a more realistic treatment of the entrainment process.

The user's guide discusses the formulation of RPM-II, the uses of RPM-II, and the necessary and optional input requirements. Several sample data sets and model printouts are included to illustrate the model's flexibility. A complete program listing is also included for the user's convenience.

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PREFACE

This publication contains information about and listings of the computer codes associated with the Reactive Plume Model (RPM-II). RPM-II is a numerical plume model that simulates the complex interaction of plume dispersion and non-linear plume photochemistry. The model can be used for single point sources and area sources and, in some special cases, multiple sources. Further refinements and extensions to the model described herein are currently under development. The purpose of this manual is to provide the user with information required to use the version of RPM-II available on the date of this publication. For information concerning later editions of RPM-II, contact: Program Manager for Model Development, Systems Applications Incorporated, 950 Northgate Drive, San Rafael, California 94903.

ABSTRACT

The Reactive Plume Model (RPM-II) is a computerized model used primarily for estimating short-term concentrations of primary and secondary pollutants resulting from point-source emissions. Two main features of the model are (1) its chemical kinetic mechanism, which explicitly solves the numerous non-linear chemical reactions associated with NO_x, ozone, and hydrocarbon cycles, and (2) the horizontal resolution within the plume, which offers a more realistic treatment of the entrainment process.

With its present chemical mechanism, RPM-II predicts concentrations of thirty-five species, given a set of input assumptions about initial precursor concentrations, light intensities, plume expansion, point-source emissions, and several meteorological variables. Input options allow some flexibility in data requirements, but in general the need for certain types of input data, such as initial and ambient precursor concentrations, is extensive.

The user's guide discusses the formulation of RPM-II, the uses of RPM-II, and the necessary and optional input requirements. Several sample data sets and model printouts are included to illustrate the model's flexibility. A complete program listing is also included for the user's convenience.

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The editorial services rendered by Rod Bell were also greatly appreciated. Finally, we gratefully acknowledge the assistance and constructive criticism of Kenneth Schere of the Meteorology Division of the U.S. Environmental Protection Agency.

SECTION 1

MODEL OVERVIEW

1.1 BACKGROUND AND PURPOSE

The Reactive Plume Model (RPM-II) is a computer program whose primary use is for estimating short term concentrations of chemically reactive point-source emissions and secondary pollutants formed within point-source plumes. Under some circumstances, it may also be applied to area sources. RPM-II (Liu, Stewart, and Roth, 1978) is an extension of an earlier model known as RPM-I (Liu, 1975); both were developed by Systems Applications, Incorporated (SAI). The capabilities and flexibility of RPM-II are much greater than those of RPM-I; most notable is RPM-II's capability to provide horizontal cross-wind resolution of the distribution of plume concentrations. Other improvements, which will increase the utility of RPM-II, are currently being developed; for example, the capabilities to resolve vertical plume concentration distributions and simulate the interaction of several point-source plumes are being added. The purpose of this manual is to document the present version of the RPM-II program for its potential users.

1.2 GENERAL MODEL CONCEPTS

RPM-II computations can be divided into two general types: the dispersion calculations and the chemical computations. The emphasis in the model is on chemical calculations; it has been designed to accommodate large, non-linear chemical reaction mechanisms which the user may choose as input. Atmospheric wind and dispersion fields are not explicitly solved (a very difficult and expensive undertaking when possible at all), but are chosen as input for the model by the user. As an option the model can internally generate dispersion rates based upon Pasquill-Gifford dispersion curves and user-specified wind speeds and stability classes. Time-varying ambient concentrations to be entrained into the plume may be added to the input by the user, or the model can compute these data based upon initial ambient concentrations and the time-varying sunlight intensities that are used as input for the model.

1.3 SCOPE AND USE

1.3.1 Applications

The present version of RPM-II is appropriate for applications to a variety of air pollution problems involving reactive pollutant species. It has been used primarily for point-source problems, but it has also seen some use in area-source problems. Currently it is capable of treating several sources at once if all the sources are lined along the same wind trajectory.

Among the types of problems to which RPM-II has been successfully applied are these:

> Evaluation of the impact of point-source NO_x emissions upon oxidant levels in downwind urban and rural areas.
> Evaluation of the impact of point-source NO_x emissions upon downwind NO_2 concentrations.
> Evaluation of the effects of area-source hydrocarbon and NO_x emissions upon oxidant levels in downwind rural and urban areas.
> Evaluation of the impact of point-source SO_2 emissions upon downwind SO_2 concentrations using a chemical kinetics package to account for the chemical conversion of SO_2 to sulfates.

The model can be potentially useful in many applications, like new source reviews, prevention of significant deterioration studies, control technology evaluations, alternate combustion fuel studies, the design of supplementary control systems, the formulation and evaluation of control strategies, visibility impairment studies, and others.

1.3.2 Limitations

It is important that the user be aware of the model's limitations that are imposed by assumptions invoked in its formulation so that misuse or misapplication of the model may be avoided. First, the model's emphasis is on chemistry and not on physical processes; it is capable of treating complex, nonlinear chemical reaction systems. The model cannot explicitly simulate the turbulent processes responsible for dispersion; it can only account for the effects of dispersion on plume concentrations. The user must provide dispersion rates, or he must provide stability information so that the model can internally compute dispersion rates based upon Pasquill-Gifford dispersion curves. The realism of the model's concentration predictions therefore hinges upon a realistic assessment, by the user, of dispersion conditions.

It is also important to note that the current version of RPM-II assumes complete vertical mixing within the plume. This implies that the model predictions should be appropriate in situations in which a convective mixing layer exists beneath an elevated inversion (i.e., trapping conditions) and farther than a distance equivalent to about ten stack heights from the source.

Some concerns have been expressed about the possible importance of what is termed diffusion limited chemistry in the plume. Essentially, this involves the reduction in the rate of chemical reactions that results because the reactants cannot be brought together quickly enough by diffusion. This is most important near the stack where concentrations are relatively high and where reaction rates are relatively fast. However, this does not appear to be a problem in any previous RPM-II simulations because most simulations have been initiated about 0.1 to 1.0 kilometer downwind of the source; this has been done to satisfy the constraints imposed by the complete mixing assumption. The user should be aware of those concerns because the potential for problems may exist in some situations.

Finally, the reader is cautioned that RPM-II is a complex model relying upon sophisticated numerical integration techniques whose accuracies and stabilities are very sensitive to many factors. For instance, use of RPM-II to simulate chemical transformations with initial concentrations greater than those for which the kinetic mechanism was designed can lead to inaccuracies and excessive execution times. Also, the delicate equilibrium that exists between the errors in the numerical solution and the optimum time step and order of the solution approximation can easily be upset by the introduction of transients into the system. These facts, coupled with the complexities of photochemical mechanisms normally used with RPM-II, may frustrate the inexperienced user. It is recommended that the user be an experienced air quality analyst with some awareness of the idiosyncrasies of numerical models.

1.4 SYSTEMS DESCRIPTION

1.4.1 Main Program Summary

RPM-II is executed independently of any other program or preprocessor. It reads only cards or card images whose formats are discussed in Section 3. The version of RPM-II described here writes all output to a printer, but it can be easily modified to write to tapes. A macroscopic flow chart for the main program is shown in Figure 1. "Ambient Run," mentioned in Figure 1, refers to the user-selected option requesting RPM-II to compute the time evolution of ambient concentrations. The user may also select the ambient run and exclude plume computations.

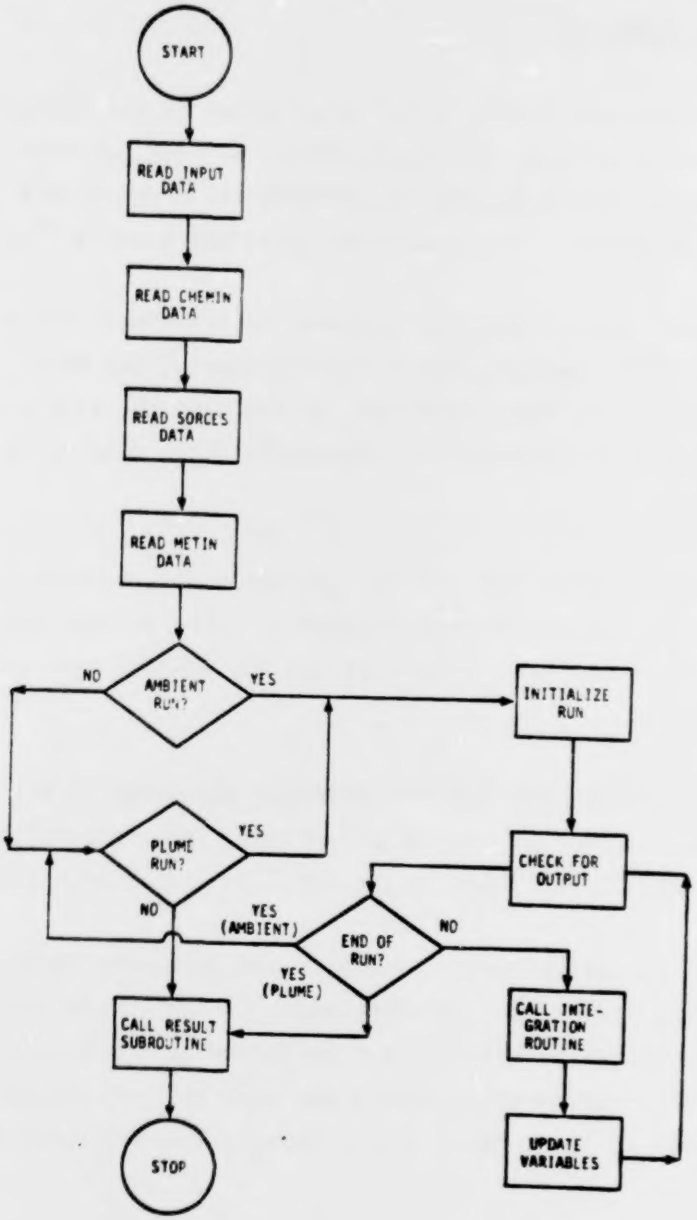

START
READ INPUT DATA
READ CHEMIN DATA
READ SORCES DATA
READ METIN DATA
AMBIENT RUN?
NO
YES
INITIALIZE RUN
PLUME RUN?
YES
NO
CHECK FOR OUTPUT
END OF RUN?
YES (AMBIENT)
YES (PLUME)
NO
CALL RESULT SUBROUTINE
CALL INTEGRATION ROUTINE
UPDATE VARIABLES
STOP

Figure 1. RPM-II macroscopic flow diagram.

1.4.2 Subroutine Summaries

This section presents a very brief description of the various functions of the main program, the subroutines, and the function subroutines. Components are discussed in alphabetical order within the hierarchy indicated above. This hierarchy is illustrated in Figure 2.

Given the model simulation type (determined from input parameters), the main program, RPM2, controls the flow direction of the model. This portion of code calls the input routines, initializes the simulation(s), and calls the integration subroutines repeatedly until completion of the simulation(s).

Subroutine CHECK determines whether any output is to be printed and calls the output subroutine when necessary. When appropriate, this subroutine also saves species' concentrations for display upon completions of the simulation(s).

Data associated with the specific chemical mechanism--i.e., chemical reactions, number of species of various types, and initial conditions--are supplied as input to the model through subroutine CHEMIN.

Calculations of initial cell dimensions and geometric factors associated with the plume cross section--width factors, cell centerline, and boundary location factors--are performed by subroutine CLLDIM. Cell dimensions are determined in such a way that each cell contains the same proportion of inert mass, with a Gaussian distribution within the plume.

Subroutine DEVCON performs two operations: One mode of operation determines cross-plume averages from individual cell averages; the other mode calculates individual cell concentrations from a plume average concentration. The concentration distribution within the plume is assumed to be Gaussian after ambient concentrations have been subtracted.

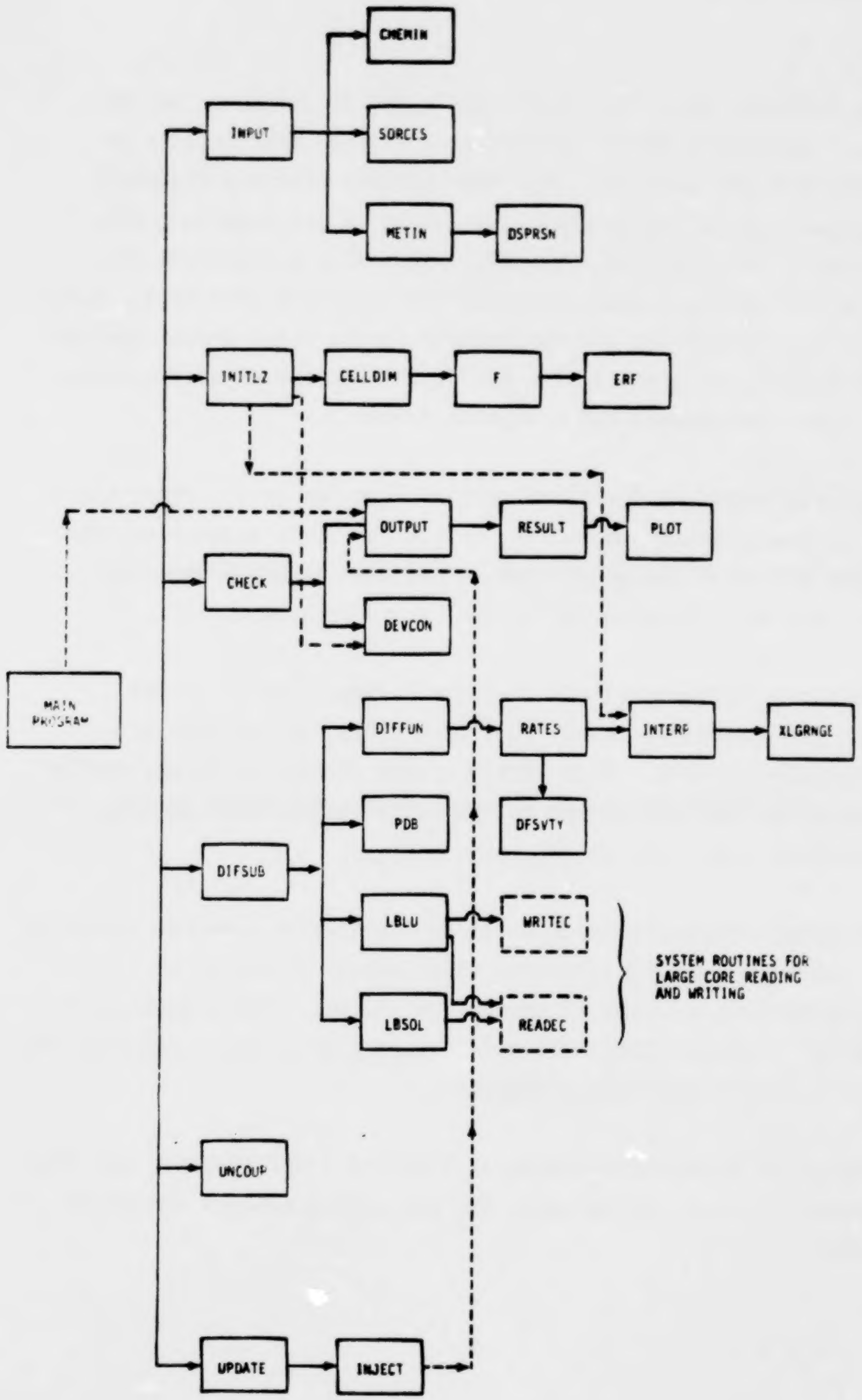

CHEMIN
INPUT
SORCES
METIN
DSPRSN
INITLZ
CELLDIM
F
ERF
OUTPUT
RESULT
PLOT
CHECK
DEVCON
MAIN PROGRAM
DIFFUN
RATES
INTERP
XLGRNGE
PDB
DFSVTY
DIFSUB
LBLU
WRITEC
LBSOL
READEC
SYSTEM ROUTINES FOR LARGE CORE READING AND WRITING
UNCOUP
UPDATE
INJECT

Figure 2. RPM-II program, subprogram, and function hierarchy.

The diffusion mass flux within the plume is parameterized by K-Theory. Subroutine DFSVTY determines diffusion coefficients in such a way that any mass flux of tracer species across a (lateral) cell boundary due to the boundary's movement is balanced by a diffusive flux in the opposite direction. This flux maintains a constant fraction of the plume's Gaussian tracer within each cell. Hence, (lateral) cell boundaries are impermeable to the inert tracer species. Reactive species can permeate the boundaries because of an imbalance between their entrainment and diffusive fluxes.

The rate equations for "differential" species (i.e., those not treated as steady-state, uncoupled, or constant) are determined from subroutine DIFFUN at any given time. The terms in these equations include chemistry, dilution, diffusion, and entrainment.

Subroutine DIFSUB controls the Gear Package,[2] which solves a system of Ordinary Differential Equations (ODEs) by the Backward Differentiation Formula. This method solves the set of concentration equations by an implicit method and is suitable for stiff systems (i.e., systems with broad ranging time scales).

For model simulations with dispersion estimates based on stability inputs, subroutine DSPRSN generates plume widths or depths or both of them corresponding to a set of downwind distances. These dimensions are obtained through a power law fit to curves of σ_y and σ_z against distance for Pasquill stability categories.

Subroutine INITLZ establishes all initial conditions for the model simulation(s). It is called twice for a combined ambient and plume simulation.

For simulations where the plume picks up emissions as it travels downwind, subroutine INJECT performs the concentration adjustments that are caused by the emissions injection. At this writing, emissions are injected into all cells with a Gaussian distribution; this treatment will be supplemented with other options at a later date.

Subroutine INPUT reads control parameters for the model simulation.

Subroutine INTERP is a cubic spline interpolation routine with several restrictions. Interpolation between two points is third order unless the calculated value lies outside the limits of the two data points, or unless the trend between successive interpolated points is the opposite of the trend of the data points. The two restrictions cause the interpolation to be linear throughout the remaining span of the two data points. They are necessary because cubic interpolation often results in spurious oscillations that, in many cases, are incompatible with the model formulation.

Subroutines LBLU and LBSOL are used to solve the system of ODEs, represented by AX=B, by Cholesky's method. Decomposition of A into a lower triangular matrix L and an upper triangular matrix U is performed by LBLU. Subroutine LBSOL then solves the system UX=Y and LY=B.

Meteorological data in the form of wind speed, plume dispersion, photolysis rate constants, and ambient species concentrations are read in through subroutine METIN.

Subroutine OUTPUT prints time, downwind distance, plume dimensions, photolysis rate constant, cross-wind plume average, and individual cell concentrations for each species. This information is printed at specific time intervals or downwind distances depending on the user's provision. Program termination also occurs within this subroutine.

The Backward Differentiation Formula used to evaluate the ODE system requires a series of equations governing the rate of change with respect to all other species of the rate equation for that particular species. Subroutine PDB evaluates this Jacobian matrix.

A graphic display of species concentration versus time is printed by subroutine PLOTA.

Subroutine RATES computes the photolysis rate constant, plume expansion rate, and ambient concentrations at a specified time. This subroutine, called from DIFFUN, provides information necessary to establish the full rate equation for species concentrations.

Subroutine RESULT prepares concentration arrays for graphic displays by PLOTA.

When the model simulation includes emissions injections, subroutine SORCES reads the data and converts emissions rates into model-compatible units (ppm m^3/sec) if input exists in units of g/sec.

Subroutine UNCOUP updates concentrations of uncoupled species.

After each sucessfully completed time step, the total simulated time and downwind distance are updated in subroutine UPDATE.

There are three function subroutines used in RPM-II. Function F represents an equation whose roots are used in establishing the plume width and other geometric factors. Function ERF evaluates the error function, while Function KLGRNG performs a third order Lagrangian interpolation.

1.5 GENERAL DATA REQUIREMENTS OF THE MODEL

The input requirements for RPM-II consist of six categories of data:

- > Meteorological data
- > Ambient and initial concentrations
- > Source emissions rates
- > Program control parameters
- > Photolysis rates
- > Chemical mechanisms.

Each of these categories is discussed in detail.

Unless otherwise specified, the standard model units are meters, minutes, and grams for length, time, and mass. Wind speeds are expressed in meters per second (m/s), and concentrations are in units of parts per million (ppm).

1.5.1 Meteorological Data

RPM-II requires that wind speed data and the dispersion rates be provided as a function of time and downwind distance respectively. Dispersion rates may be specified in the form of plume widths and depths as a function of downwind distance, or the user may specify a stability class and allow the model to compute the dispersion rates.

1.5.2 Ambient and Initial Concentrations

The user must specify an average initial concentration in the plume parcel for all species required by the chemical mechanism being used. These initial concentrations may include the contribution of source emissions to the plume concentrations at the downwind location where the model simulation is initiated. The model will impose a Gaussian distribution across the horizontal array of cells upon emitted pollutant species concentrations.

The user must also specify concentrations for all species to be entrained into the plume as it disperses. The user has the option of specifying time-varying ambient concentrations or allowing RPM-II to compute time variations within ambient concentrations.

1.5.3 Source Emissions Rates

If source emissions are to be injected into the plume parcel after the simulation is initiated (for example, when the plume of one source passes over another source), RPM-II requires that the downwind locations and emissions rates of the sources be supplied as input.

1.5.4 Program Control Parameters

A large quantity of input data is required by RPM-II for program control. The data are required for selecting options, controlling the numerical integration calculations, and specifying other simulation parameters. Detailed discussions of these input data can be found in Section 3.

1.5.5 Photolysis Rates

The rate of photolysis reactions within the system of reactions specified by the user must be provided for the model. The user may specify the factors as a function of time, which RPM-II applies to the photolysis reaction rates specified in the chemical mechanism.

1.5.6 Chemical Mechanism

Currently, RPM-II is exercised with the carbon-bond condensed photochemical reaction mechanism (Whitten and Hogo, 1979).[3] The mechanism is part of the input to the model, and another suitable mechanism may be substituted. A mechanism is provided as input in the form of a set of card images containing the stoichiometric coefficients of all products and reactants and the reaction rate of each reaction step in the mechanism.

1.6 SUMMARY OF MODEL OUTPUT

RPM-II provides the following types of output:

> Printout of input data.
> Printout of program control variables.
> Printout of plume concentrations, plume widths, plume depths, wind speed, photolysis factors, and various downwind distances.
> Printer plots of average plume and ambient concentrations versus time.

Average concentrations are printed for each species within each plume cell as well as average concentrations for the entire plume. The output of RPM-II is presented in greater detail in Section 3.

1.7 COMPUTER REQUIREMENTS

As it is currently configured, RPM-II requires about 83,000 decimal words of core storage. It does not read or write on tape. Execution times can vary substantially depending upon many factors such as wind speed; simulation period; downwind ambient and initial concentration mixes; number of cross-wind cells; etc. Typically a six-cell simulation of a single-source plume to about 70 kilometers downwind requires about 15 seconds of CDC 7600 control processor time. The computer code is written in standard Fortran IV.

SECTION 2

TECHNICAL DISCUSSION

2.1 PLUME CONFIGURATION

The Reactive Plume Model (RPM-II) consists of an array of well-mixed reactors or cells across the plume. As suggested in Figure 3, the configuration of the plume is changed as it travels away from its source. Assume that the width and height of cell j can be described by two parameters:

$$w^j = w^j(s) \quad \text{and} \tag{2-1}$$

$$h^j = h^j(s) \quad , \tag{2-2}$$

where w^j denotes the width of cell j, h^j is the vertical thickness of the plume, and s represents the distance downwind of a point source measured along the plume axis. Based on a mass balance, the governing equation along a wind trajectory s can then be expressed as

$$\frac{dc_i^j}{dt} = \left(\frac{dc_i^j}{dt}\right)_{chem} - \left(\frac{1}{w^j} \cdot \frac{dw^j}{ds}\right) uc_i^j - \left(\frac{1}{h^j} \cdot \frac{dh^j}{ds}\right) uc_i^j \quad ; \tag{2-3}$$

$$i = 1, 2, \ldots, N; \qquad j = 1, 2, \ldots, M;$$

where c_i^j denotes the concentration of chemical species i in cell j, u is the wind speed along the plume trajectory, and t is time since emission. In the revised model, the total mass of each primary pollutant is initially divided equally among M cells. By allowing the volume of each cell to expand as dictated by atmospheric dispersion, cell boundaries can be viewed as impermeable for unreactive pollutants. Thus, only the diffusion of reactive and entrained pollutants must be parameterized. For example,

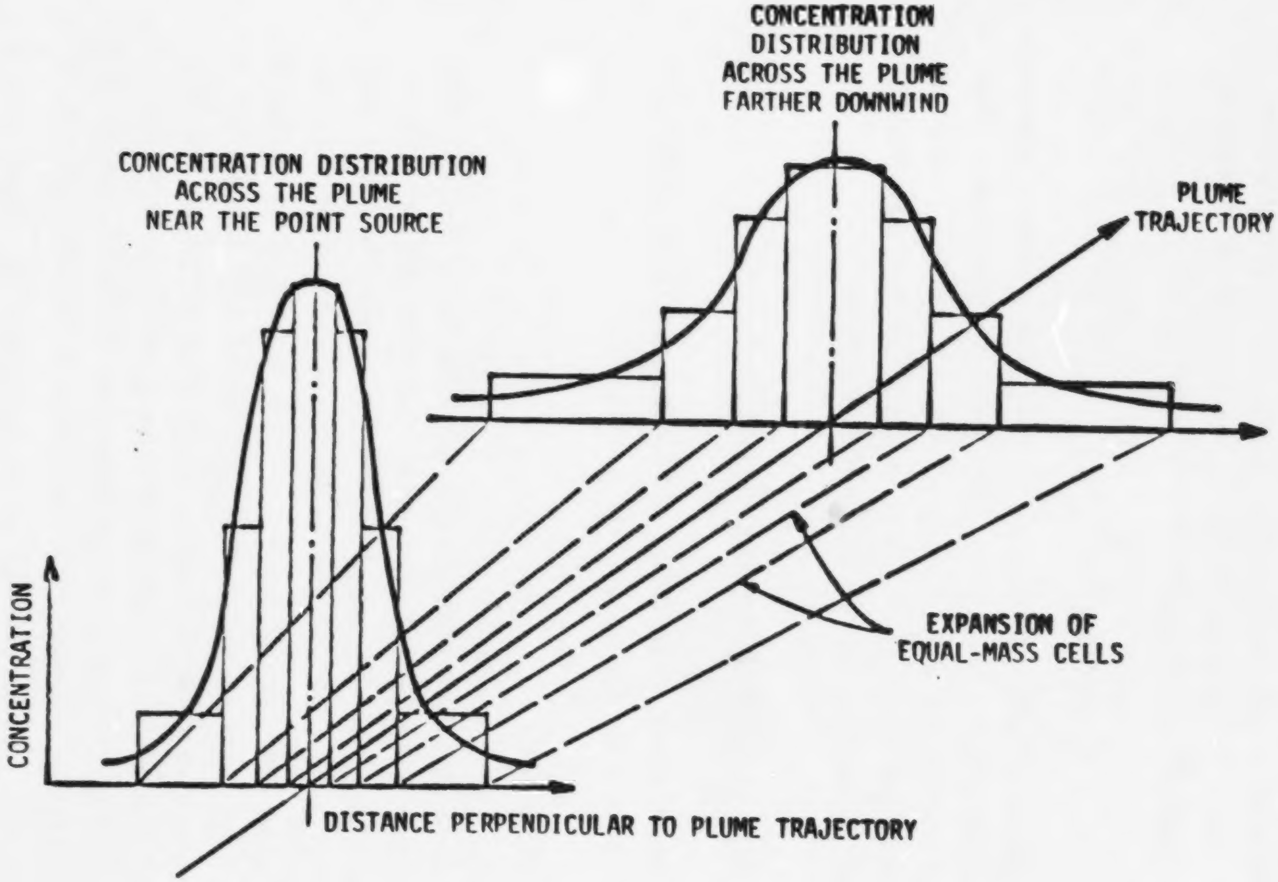

CONCENTRATION DISTRIBUTION
ACROSS THE PLUME
NEAR THE POINT SOURCE
CONCENTRATION
DISTRIBUTION
ACROSS THE PLUME
FARTHER DOWNWIND
PLUME
TRAJECTORY
CONCENTRATION
EXPANSION OF
EQUAL-MASS CELLS
DISTANCE PERPENDICULAR TO PLUME TRAJECTORY

Figure 3. Schematic of plume expansion as a function of downwind distance in RPM-II.

within the framework of a Gaussian formulation and for an elliptically shaped plume, the radii (in transformed polar coordinates) of concentric rings containing equal pollutant masses can be shown to be

$$r_j = \sqrt{2\ell n\left(\frac{M}{M - j}\right)} \quad , \qquad (2\text{-}4)$$

where r_j is the radius of the j-th concentric ring, and σ_y and σ_z represent the horizontal and vertical dispersion coefficients for the plume. (The transformed polar coordinates are given by $r^2 = y^2/\sigma_y^2 + z^2/\sigma_z^2$.) Under plume-trapping conditions, the width of the j-th cell in a rectangular-shaped plume can be found by solving the transcendental equation:

$$\frac{2}{M} = \text{erf}\left(\frac{Y_j}{\sqrt{2}\sigma_y}\right) - \text{erf}\left(\frac{Y_{j-1}}{\sqrt{2}\sigma_y}\right) \quad , \qquad (2\text{-}5)$$

where Y_j is the width of the j-th cell. This recursive relationship can be solved numerically given the outer cell's boundary, y_1.

2.2 HORIZONTAL DISPERSION

One of the most important processes in the behavior of a plume from a large point source is horizontal dispersion. As shown in Figure 3, the revised reactive plume model is composed of a fixed number of cells that can expand as they move downwind. For an inert species emitted from the source, the rates of expansion of these cells are determined by horizontal dispersion such that there is no net mass flux across cell boundaries. For a background or a reactive pollutant, the Fickian diffusion approach is adopted: The flux across the interface between cells j and j+1 is assumed to be equal to the product of an equivalent diffusion coefficient K_j and the concentration gradient of a background or reactive species is relative to the concentration gradient of an inert species. That is,

$$F_j = -K_j\left(\frac{c}{y}\bigg|_j - \frac{\tilde{c}}{y}\bigg|_j\right) \quad , \qquad (2\text{-}6)$$

where c and $\tilde{c}$ denote the concentration distributions of the background or reactive pollutant and the inert species, respectively. The equivalent diffusion coefficient can be determined by considering the case of a constant background concentration c_B. Since c_B should be unchanged after each time step, a simple balance of mass fluxes for cell j yields

$$c_B\left(\frac{dy_j}{dt}\right) - c_B\left(\frac{dy_{j-1}}{dt}\right) = K_j\left(\frac{\partial \tilde{c}}{\partial y}\bigg|_j\right) - K_{j-1}\left(\frac{\partial \tilde{c}}{\partial y}\bigg|_{j-1}\right) \quad . \qquad (2\text{-}7)$$

Assuming local symmetry at the centerline of the plume, one may impose

$$K_0 = 0 \quad . \qquad (2\text{-}8)$$

Then the equivalent diffusion coefficient K_j can be solved by using the recurrence formula in Eq. (2-7) with appropriate finite difference approximations.

2.3 KINETIC MECHANISM

Applications of the reactive plume model require a kinetic mechanism describing pertinent chemical reactions. This mechanism must specify the elementary kinetic steps and their associated rate constants.

In the past, extensive efforts have been made to develop a valid kinetic mechanism for photochemical smog, focusing primarily on systems of hydrocarbons and nitrogen oxides.[4] The revised version of the Reactive Plume Model incorporates a recently developed kinetic module, the Carbon-Bond Mechanism (CBM).[2] This mechanism includes the latest information on more than 60 reaction steps to model chemical transformations in HC-NO_x-O_3 systems. A list of these steps and their associated rate constants appears in Appendix A. The CBM has been found to simulate the reactivities of hydrocarbon compounds in the atmosphere more accurately than the mechanism in the original reactive plume model.

2.4 TECHNIQUE FOR NUMERICAL SOLUTION

Eq. (2-3) represents a system of ordinary differential equation (ODEs) whose solutions are obtained using an algorithm developed by C. W. Gear.[4] This algorithm has been selected because of its ability to accurately treat stiff systems of equations. An ODE system can be considered stiff if it involves both rapidly and slowly varying terms. The stiffness of a system can be measured by the ratio of the maximum to minimum decaying time constants inherent in the system. The system of equations formulated for RPM-II contains a very broad range of time constants, from very small time constants typical of fast radical reactions to the diffusive nature of the atmosphere and the formation of secondary pollutants that have greater time constants.

Solution of the ODE system is accomplished by means of a linear, multipoint method known as the Backward Differentiation Formula (BDF). Given the general form of Eq. 2-3,

$$\frac{dy_i(t)}{dt} = f_i\,(y_1\,(t),\, y_2\,(t),\, \ldots\, y_N\,(t),\, t) \quad , \qquad (2\text{-}9)$$

where y and f are vectors of length $N \geq 1$; the BDF approximation can be represented by

$$y_n = \sum_{j=1}^{q} \alpha_j\, y_{n-j} + h\beta \dot{y}_n \quad , \qquad (2\text{-}10)$$

where y_k is an approximation to $y(t_k)$, and $\dot{y}_k = f(y_k,\, t_k)$ is an approximation to $\dot{y}(t_k)$. Constants α_j and β are associated with the order q, and h is the time step. After dividing by $h\beta$, equation 2-10 becomes a numerical approximation to Eq. 2-9 involving only the values of y at y_n, y_{n-1}, ... y_{n-q}, or:

$$\dot{y}_n = \frac{1}{h} \sum_{j=0}^{q} \gamma_j\, y_{n-j} \quad , \text{ where } \gamma_0 = \frac{+1}{\beta}, \quad \gamma_j = \frac{-\alpha_j}{\beta} \text{ and } 1 \leq j \leq q. \qquad (2\text{-}11)$$

If we define

$$g(y_n) \equiv \sum_{j=0}^{q} \gamma_j \, y_{n-j} - h\dot{y}_n \quad ,$$

then the solution to Eq. (2-11) can be reduced to solving the nonlinear system $g(y_n) = 0$ by successive approximations. Newton's method is chosen for obtaining the solution:

$$\begin{aligned} Y_n(m+1) &= Y_n(m) - P_n^{-1}(m)\, g\,(Y_n(m)), \\ P_n(m) &= \frac{\partial g}{\partial y}\Big|_{y_n(m)} \quad . \end{aligned} \qquad (2\text{-}12)$$

The N x N matrix $P_n(m)$ is called the Jacobian, and is determined analytically in RPM-II. The complete algorithm for the successive approximations to the solution at time step n are written from Hindmarsh[5] as follows:

$$\underline{z}_{n(0)} = \underline{z}_{n-1}\, A$$

$$\left.\begin{aligned} y_{n(m+1)} &= y_{n(m)} + \ell_0\, P_n^{-1}\, F_{(m)} \\ h\dot{y}_{n(m+1)} &= h\dot{y}_{n(m)} + P_n^{-1}\, F_{(m)} \\ F_{(m)} &\equiv hf\left(y_{n(m)},\, t_n\right) - h\dot{y}_{n(m)} \end{aligned}\right\} \quad (m = 0, 1, \ldots, M-1) \qquad (2\text{-}13)$$

$$y_n = y_{n(M)} = y_{n(0)} + \ell_0\, E_n \quad .$$

$$E_n \equiv \sum_{m=0}^{M-1} P_n^{-1}\, F_{(m)}$$

$$\underline{z}_n = \underline{z}_{n(0)} + E_n\, \underline{\ell} \quad .$$

In the above algorithm, M is the number of iterations performed, ℓ is a row vector of constants for the BDF method, Z_n in an N x L array of scaled derivative of y at t_n, L = q + 1 and A is the L x L Pascal triangle matrix. The vector E_n is the estimated truncation error occurring during step 4 of Eq. 2-13.

The calculation of $P_n^{-1} F_{(m)}$ is performed by Cholesky's method, whereby P_n is factored into a lower and upper triangular matrix, L and U respectively; then the matrix multiplication $P_n^{-1} F_{(m)} = B$ is equivalent to the multiplications $UF_{(m)}=1$ and $LY=B$, which are both simple triangular linear systems.

At intervals of q + 2 time steps, the Gear algorithm attempts to choose a larger time step h, by estimating the local truncation errors at orders q-1, q, and q + 1. By allowing the truncation error to be as large as the desired tolerance, the maximum value of h', obtained at orders q-1, q, and q + 1, is chosen as the new time step.

The extreme complexity of the numerical solution technique precludes detailed flow charts, at the subroutine level, in a user's guide of this nature. Questions concerning the numerical method may be answered by referring to the references of Gear and Hindmarsh or by contacting the Model Development Group at SAI.

SECTION 3

INPUT AND OUTPUT DATA DEFINITIONS AND STRUCTURE

3.1 INPUT DATA DEFINITION AND STRUCTURE

The data deck required in running RPM-II is conveniently divided into five sections, each of which is read from a separate subroutine. Subroutine names and the order of data input are illustrated in Figure 4. The following sections discuss the input variables read in each of the five subroutines: INPUT, CHEMIN, SORCES, METIN, and RESULT. Also, three sample data sets are provided.

3.1.1 INPUT: Variables

The following list of input variables is read from subroutine INPUT. The variables define the type of plume simulation desired (multiple, single far-source, single near-source, etc.) and establish integration parameters, the length of the simulation, output intervals, and several plume parameters. (Figure 5).

> INCOM--Array dimensioned (20) containing comment, usually identifying data source.

> MODE1--Operating Mode.

- MODE1 = 1--Single plume simulation.
- MODE1 = 2--Multiple plume simulation.*

> MODE2--Operating Mode.

- MODE2 = 1--Ambient simulation only.
- MODE2 = 2--Plume simulation only.
- MODE2 = 3--Ambient simulation followed by plume simulation.

---

* Not operational at this writing.

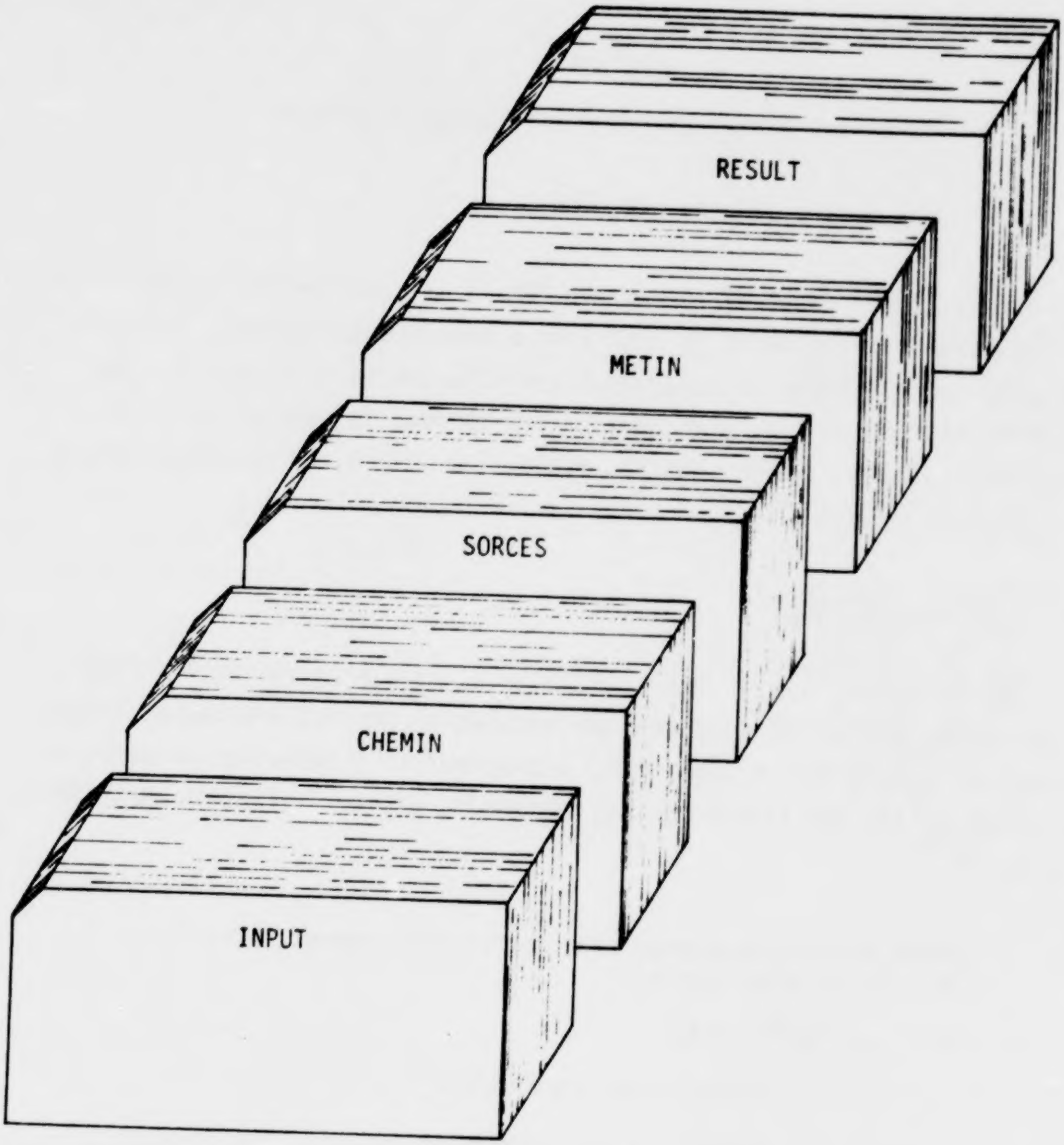

RESULT
METIN
SORCES
CHEMIN
INPUT

Figure 4. Illustration of general data deck setup.

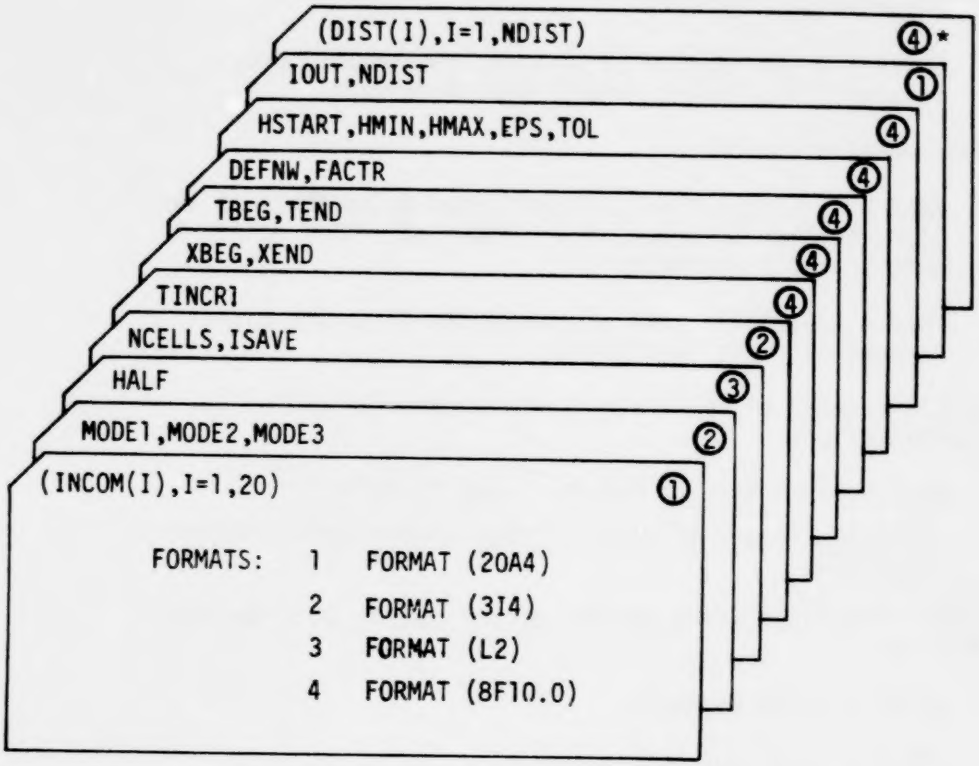

(DIST(I),I=1,NDIST) ④*
IOUT,NDIST ①
HSTART,HMIN,HMAX,EPS,TOL ④
DEFNW,FACTR ④
TBEG,TEND ④
XBEG,XEND ④
TINCR1 ④
NCELLS,ISAVE ②
HALF ③
MODE1,MODE2,MODE3 ②
(INCOM(I),I=1,20) ①
FORMATS: 1 FORMAT (20A4)
2 FORMAT (3I4)
3 FORMAT (L2)
4 FORMAT (8F10.0)

Figure 5. INPUT: Data deck structure and formats.

---

* Optional card. Not required if IOUT=1.

- MODE3--Operating Mode.
    - MODE3 = 1--Near source simulation; elliptical cross sections.*
    - MODE3 = 2--Near source merging to far source; elliptical cross section merging to uniform vertical distribution, i.e., capped mixed layer.*
    - MODE3 = 3--Far source simulation; rectangular cross section, i.e., capped mixed layer treatment.
- HALF--Half Plume Option.
    - HALF = T--Calculations are performed on one half of the plume (symmetric assumption is implied); this option is slightly more economical.
    - HALF = F--Calculations are performed on entire plume; asymmetric plume is allowed.
- NCELLS--Number of cells across the plume (far source approximation).
    - Must be even integer between 2 and 10 inclusive.
    - Twice the number of cells if near source approximation (MODE3=1).
- ISAVE--Flag indicating whether or not output is to be saved on disk.
    - ISAVE = 1--Save output.
    - ISAVE = 0--Do not save output.
- TINCR1--Time increment indicating intervals between successive outputs.
- XBEG--Initialization distance downwind of point source.
- XEND--Final distance downwind of point source.
- TBEG--Initialization time.
- TBEND--Ending time of simulation.
- DEFNW--Parameter indicating plume width definition (in multiples of sigma-y).

---

* Not operational at this writing.

> FACTR--Distance factor for calculating gradients across plume edge. (Currently, the parameter is set equal to the width of the outer cell in the sample data set. Extensive tests have not been conducted to determine the sensitivity of this variable.)

> HSTART--Initial time step.

> HMIN--Minimum time step.

> HMAX--Maximum time step.

> EPS--Error bound used in ordinary differential equation (ODE) system solver.

> TOL--Tolerance limit for steady state approximation.

> IOUT--Output Option.

- IOUT = 1--Output at time intervals given by TINCRI.
- IOUT = 2--Output at given downwind distances.

> DIST--Array of downwind distances for use when IOUT = 2; if IOUT = 1, this variable is not read in.

3.1.2 CHEMIN: Variables

The following list of input variables is read from subroutine CHEMIN. The variables indicate various types of chemical species within the chemical kinetics package, reactions involved in the kinetics, and initial species concentrations (Figure 6).

> CHMCOM--Array dimensioned (20) containing a comment referring to the chemical kinetics package being utilized.

> NRXN--Number of chemical reactions.

> NDIF--Number of differential species (i.e., species involved in the ODE system).*

> NSTS--Number of steady-state species.*

> NUNC--Number of uncoupled species (products only).*

> NINT--Number of inert or constant species.*

---

* Initial species and concentrations are read in the following order: NDIF, NSTS, NUNC, NINT.

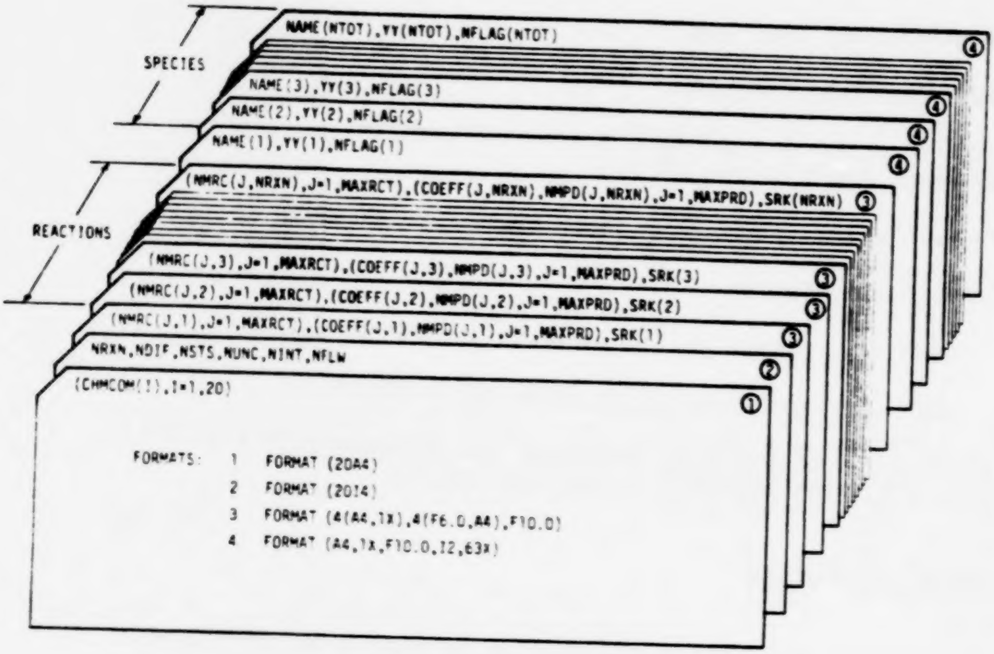

SPECIES
REACTIONS
NAME(NTOT),YY(NTOT),NFLAG(NTOT) ④
NAME(3),YY(3),NFLAG(3) ④
NAME(2),YY(2),NFLAG(2) ④
NAME(1),YY(1),NFLAG(1) ④
(NMRC(J,NRXN),J=1,MAXRCT),(COEFF(J,NRXN),NMPD(J,NRXN),J=1,MAXPRD),SRK(NRXN) ③
(NMRC(J,3),J=1,MAXRCT),(COEFF(J,3),NMPD(J,3),J=1,MAXPRD),SRK(3) ③
(NMRC(J,2),J=1,MAXRCT),(COEFF(J,2),NMPD(J,2),J=1,MAXPRD),SRK(2) ③
(NMRC(J,1),J=1,MAXRCT),(COEFF(J,1),NMPD(J,1),J=1,MAXPRD),SRK(1) ③
NRXN,NDIF,NSTS,NUNC,NINT,NFLW ②
(CHMCOM(I),I=1,20) ①
FORMATS: 1 FORMAT (20A4)
2 FORMAT (20I4)
3 FORMAT (4(A4,1X),4(F6.0,A4),F10.0)
4 FORMAT (A4,1X,F10.0,I2,63X)

Figure 6. CHEMIN: Data deck structure and formats.

> NFLW--Number of flowing species (entrained species).

> NMRC--Two-dimensional array (MAXRCT, NRXN) containing the name of the reactant species for a given reaction.

> COEFF--Two-dimensional array (MAXPRD, NRXN) containing the stoichiometric coefficient for each product species for each reaction.

> NMPD--Two-dimensional array (MAXPRD, NRXN) containing the name of the product species for a given reaction.

> SRK--Array dimensioned (NRXN) containing the rate constant for the particular reaction.

> NAME--Array dimensioned (NTOT = NDIF + NSTS + NUNC + NINT) containing the name of input species.

> YY--Array dimensioned (NTOT) containing the initial concentration of corresponding species.

> NFLAG--Array dimensioned (NTOT) containing a flag indicating whether the species is emitted from the point source.

- NFLAG = 1--Species is an emitted species.
- NFLAG = 0--Species is not emitted from the point source.

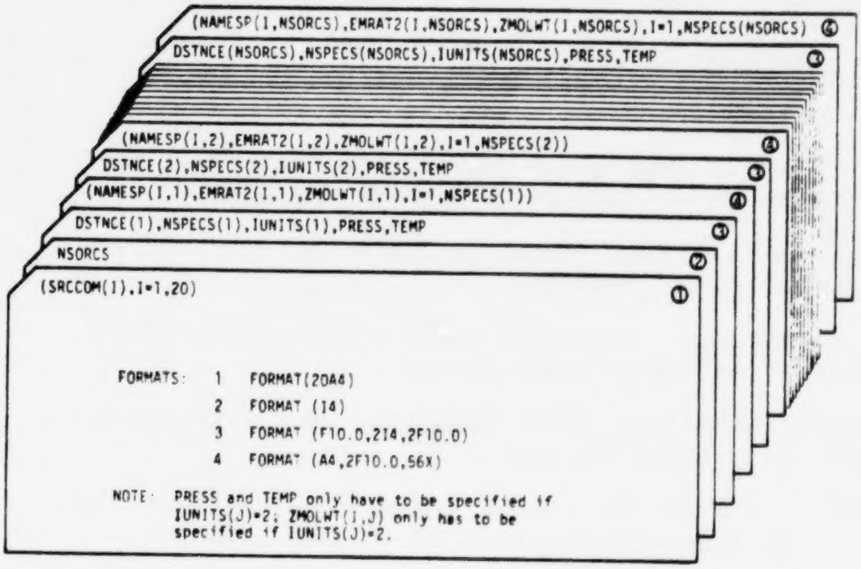
3.1.3 SORCES: Input Variables

The function of subroutine SORCES is to read point source location information and emissions inventories. Two emissions input options are available: Emissions rates may be specified in units of ppm m^3/sec. or units of g/sec. The latter option requires input of ambient pressure (in mb), temperature (°K), and molecular weight for each emitted species; these variables are used to convert units from g/sec to ppm m^3/sec. (Figure 7).

> SRCCOM--Array dimensioned (20) containing a comment, usually referring to point source identifiers.

> NSORCS--Number of point sources to be input.

> DSTNCE--Array dimensioned (10) containing the downwind distance of the point source from the model origin for each point source.


(NAMESP(I,NSORCS),EMRAT2(I,NSORCS),ZMOLWT(I,NSORCS),I=1,NSPECS(NSORCS) ④
DSTNCE(NSORCS),NSPECS(NSORCS),IUNITS(NSORCS),PRESS,TEMP ③
(NAMESP(I,2),EMRAT2(I,2),ZMOLWT(I,2),I=1,NSPECS(2)) ④
DSTNCE(2),NSPECS(2),IUNITS(2),PRESS,TEMP ③
(NAMESP(I,1),EMRAT2(I,1),ZMOLWT(I,1),I=1,NSPECS(1)) ④
DSTNCE(1),NSPECS(1),IUNITS(1),PRESS,TEMP ③
NSORCS ②
(SRCCOM(I),I=1,20) ①

```
FORMATS:  1   FORMAT(20A4)
          2   FORMAT (I4)
          3   FORMAT (F10.0,2I4,2F10.0)
          4   FORMAT (A4,2F10.0,56X)
```

NOTE: PRESS and TEMP only have to be specified if IUNITS(J)=2; ZMOLWT(I,J) only has to be specified if IUNITS(J)=2.

Figure 7. SORCES: Data deck structure and formats.

> NSPECS--Array dimensioned (10) containing the number of species emitted for each point source.

> IUNITS--Array dimensioned (10) containing the emissions rate option for each point source.*

> PRESS--Ambient pressure at a particular point source (mb).*

> TEMP--Ambient temperature at a particular point source (°K).*

> NAMESP--Two-dimensional array (NSPECS(J),J) containing the name of each emitted species for each point source.

> EMRAT2--Two-dimensional array (NSPECS(J),J) containing the emissions rate (in either ppm m^3/sec or g/sec.) for each species and each point source.

> ZMOLWT--Two-dimensional array (NSPECS(J),J) containing the molecular weight of each species for each point source.*

3.1.4 METIN: Input Variables

Subroutine METIN reads meteorological data and ambient species concentrations. Currently there are two options for specifying the plume dispersion: The stability may be specified, or widths and depths at various downwind distances may be read in. There are no options available for the other input variables in this subroutine at this writing, but these can easily be added at a later date (Figure 8).

> METCOM--Array dimensioned (20) containing comments relating to the meteorological input.

> WNDOPT--Wind Option.

- WNDOPT = 1--Input of various wind speeds at specific times.

---

* If IUNITS = 2, PRESS, TEMP, and ZMOLWT need not be specified.

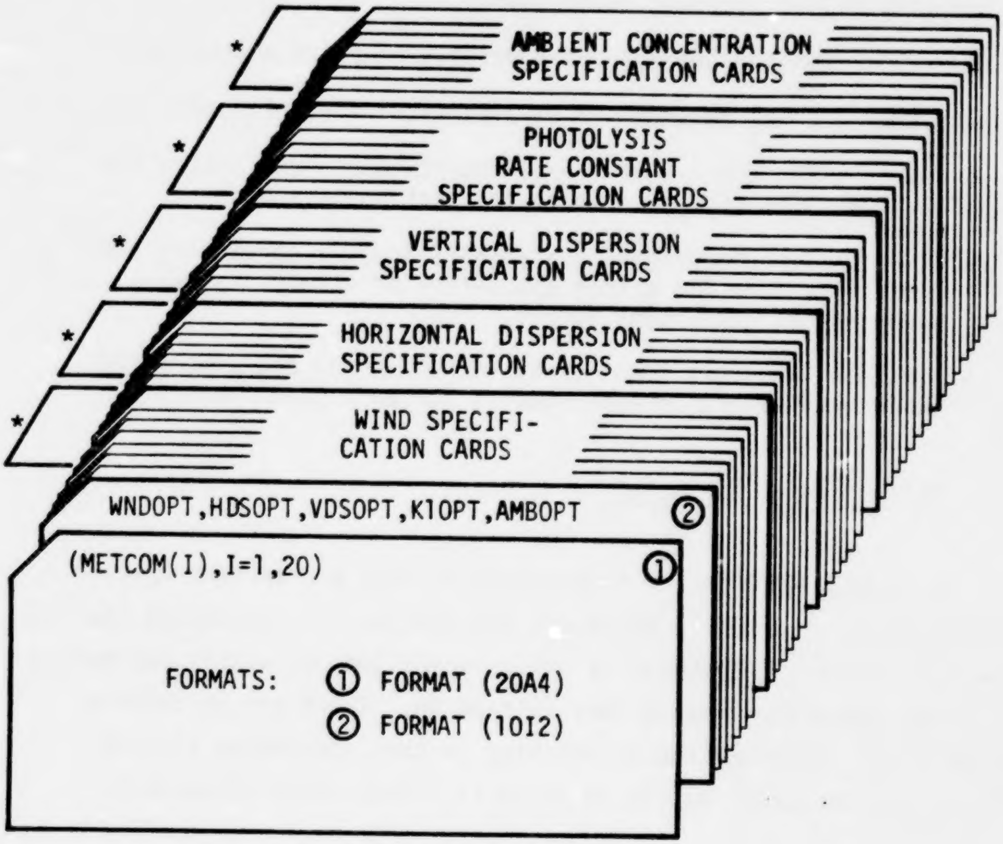

AMBIENT CONCENTRATION SPECIFICATION CARDS
PHOTOLYSIS RATE CONSTANT SPECIFICATION CARDS
VERTICAL DISPERSION SPECIFICATION CARDS
HORIZONTAL DISPERSION SPECIFICATION CARDS
WIND SPECIFICATION CARDS
*
WNDOPT,HDSOPT,VDSOPT,K1OPT,AMBOPT ②
(METCOM(I),I=1,20) ①
FORMATS: ① FORMAT (20A4)
② FORMAT (10I2)

Figure 8. METIN: Data deck structure and formats.

---

* Input variables within these sections are discussed on the following page.

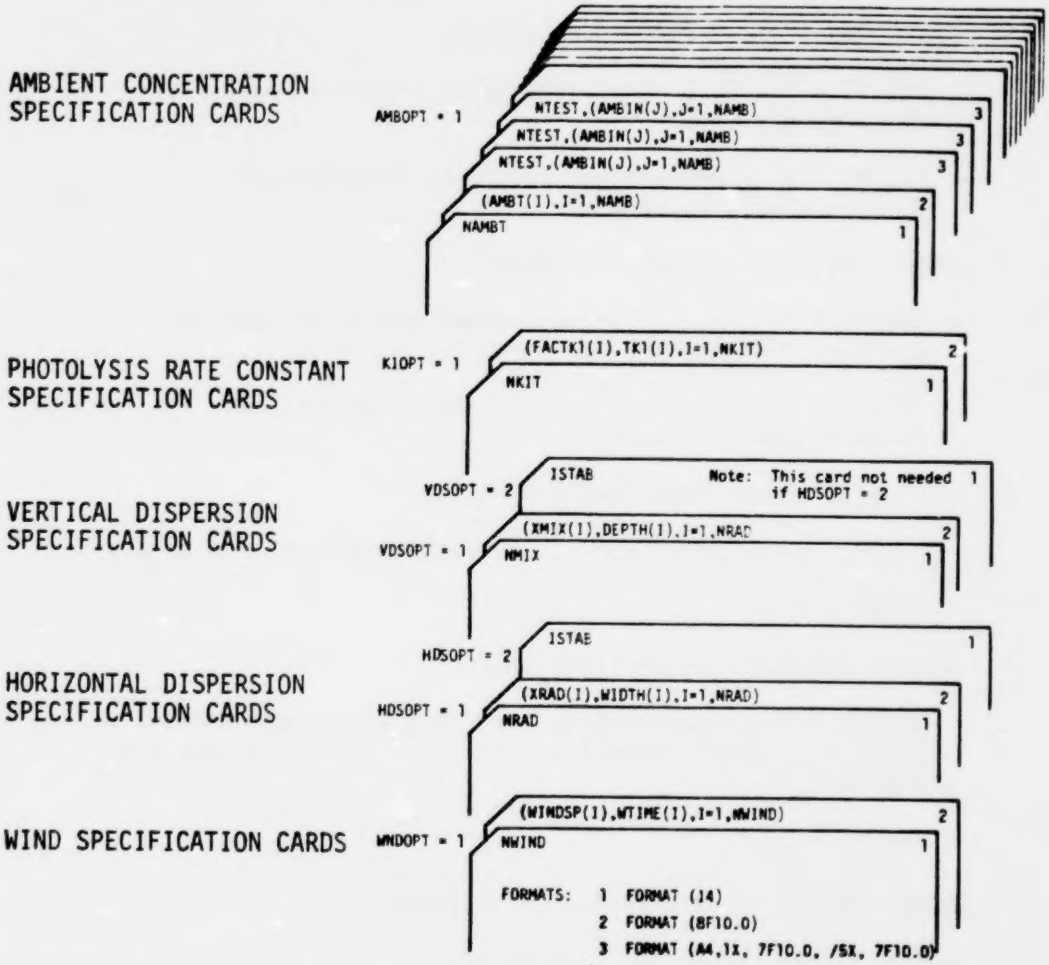

AMBIENT CONCENTRATION SPECIFICATION CARDS
AMBOPT = 1
NTEST,(AMBIN(J),J=1,NAMB) 3
NTEST,(AMBIN(J),J=1,NAMB) 3
NTEST,(AMBIN(J),J=1,NAMB) 3
(AMBT(I),I=1,NAMB) 2
NAMBT 1
PHOTOLYSIS RATE CONSTANT SPECIFICATION CARDS
KIOPT = 1
(FACTK1(I),TK1(I),I=1,NKIT) 2
NKIT 1
VERTICAL DISPERSION SPECIFICATION CARDS
VDSOPT = 2
ISTAB
Note: This card not needed if HDSOPT = 2
1
VDSOPT = 1
(XMIX(I),DEPTH(I),I=1,NRAD 2
NMIX 1
HORIZONTAL DISPERSION SPECIFICATION CARDS
HDSOPT = 2
ISTAB 1
HDSOPT = 1
(XRAD(I),WIDTH(I),I=1,NRAD) 2
NRAD 1
WIND SPECIFICATION CARDS
WNDOPT = 1
(WINDSP(I),WTIME(I),I=1,NWIND) 2
NWIND 1
FORMATS: 1 FORMAT (I4)
2 FORMAT (8F10.0)
3 FORMAT (A4,1X, 7F10.0, /5X, 7F10.0)

Figure 8 (Concluded).

- WNDOPT = 2--*

> HDSOPT--Horizontal Dispersion Option.

- HDSOPT = 1--Input of various plume widths at specific downwind distances.

- HDSOPT = 2--Plume widths calculated from Pasquill-Gifford stability curves.

> VDSOPT--Vertical Dispersion Option.

- VDSOPT = 1--Input of various plume depths at specific downwind distances.

- VDSOPT = 2--Plume depths calculated from Pasquill-Gifford stability curves.

> K1OPT--Photolysis Rate Constant Option.

- K1OPT = 1--Input of various K1 factors at specific times.

- K1OPT = 2--*

> AMBOPT--Ambient Concentration Option.

- AMBOPT = 1--Concentrations are input at various times (if MODE2 = 1, input concentrations after initial values are ignored).

- AMBOPT = 2--*

> NWIND--Number of wind speeds to be input.

> WINDSP--Array containing wind speeds.

> WTIME--Array of times corresponding to WINDSP.

> NRAD--Number of plume widths to be input.

> XRAD--Array of downwind distances for width input.

> WIDTH--Array of widths corresponding to XRAD.

> ISTAB--Stability Index (Pasquill-Gifford stabilities)

- ISTAB = 1--Stability Class A.

---

* Not available at this writing.

- ISTAB = 2--Stability Class B.
- ISTAB = 3--Stability Class C.
- ISTAB = 4--Stability Class D.

> NMIX--Number of mixing depths (plume depths).

> XMIX--Array of downwind distances for depth input.

> DEPTH--Array of plume depths corresponding to XMIX.

> NK1T--Number of K1 factors.

> FACTK1--Array of photolysis rate constants (K1 factors).

> TK1--Array of times corresponding to FACTK1.

> NAMBT--Number of sets of ambient concentrations.

> AMBT--Array of times at which ambient concentrations are input.

> NTEST--Variable containing name of ambient species.

> AMBIN--Array of concentrations of NTEST corresponding to AMBT.

3.1.5 RESULT: Input Variables

Subroutine RESULT reads species names, the concentrations of which will be plotted by subroutine PLOT (Figure 9).

> NSPEC--Number of species to be plotted.

> ISPEC--Array dimensioned (40) containing species names.

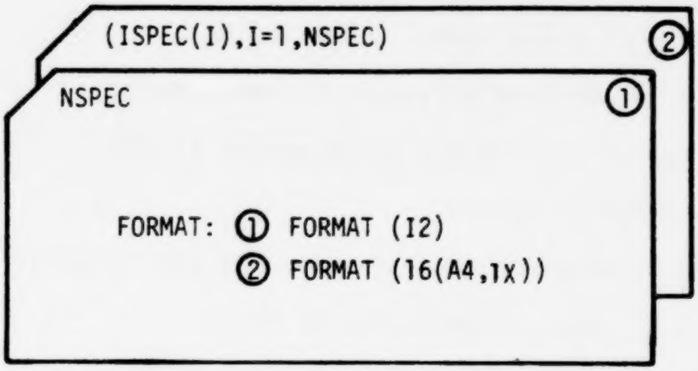

(ISPEC(I),I=1,NSPEC)
②
NSPEC
①
FORMAT: ① FORMAT (I2)
② FORMAT (16(A4,1X))

Figure 9. RESULT: Data deck structure and formats.

3.1.6 Discussion of Sample Data Set No. 1

The following data set provides the input to RPM-II that is necessary for a single plume simulation with the far source approximation (mixed layer). Because the emissions input section shows NSORCS=0, the initial species concentrations must contain the ambient concentration plus the plume average concentration. Plume average concentrations can be obtained by dividing emissions rates (in ppm m^3/sec) by the initial area of the plume cross-section and the wind speed. Those species emitted by the source are indicated with a flag (NFLAG=1) (Figure 10).

The remainder of the data set is easily understood with the aid of the discussion in Sections 3.1.1 to 3.1.5.

```
RPM-II ... TEST DATA NO. 1
   1   2   0
 T
   6   0
10.0        10.0
100.0       33000.0
0.0         100.0
4.0         1.0
    1.E-16     1.E-16       10.0       0.005      0.005
  1
CHEMISTRY INPUT ..... CARBON BOND MECHANISM UPDATED 1978
  60   17   12   5    1   13
NO2                 1.    NO   1.    O                                 1.0
O                   1.    O3                                           4400000.
O3   NO             1.    NO2  1.    O2                                23.9
O3   NO2            1.    NO3  1.    O2                                0.048
O    NO2            1.    NO   1.    O2                                13400.
O3   OH             1.    HO2  1.    O2                                77.0
O3   HO2            1.    OH   2.    O2                                5.0
NO2  OH             1.    HNO3                                         14000.
CO   OH             1.    HO2  1.    CO2                               440.
NO   NO             2.    NO2                                          0.00012
NO3  NO             2.    NO2                                          30000.
NO3  NO2  H2O       2.    HNO3                                         0.000031
HO2  NO             1.    NO2  1.    OH                                12000.
HO2  HO2                                                               15000.
PAR  O              1.    MEO21.     OH                                20.
PAR  OH             1.    MEO2                                         1300.
OLE  O              1.    MEO21.     ACO31.     X                      2700.
OLE  O              1.    CARB1.     PAR                               2700.
OLE  OH             1.    RAO2                                         42000.
OLE  O3             1.    CARB1.     CRIC                              0.008
OLE  O3             1.    CARB1.     MCRC1.     X                      0.006
ETH  O              1.    MEO21.     HO2  1.    CO                     600.
ETH  O              1.    CARB1.     PAR                               600.
ETH  OH             1.    RBO2                                         12000.
ETH  O3             1.    CARB1.     CRIC                              0.0024
ACO3 NO             1.    NO2  1.    MEO21.     CO2                    3800.
RBO2 NO             1.    NO2  2.    CARB1.     HO2                    12000
RAO2 NO             1.    NO2  2.    CARB1.     HO2                    12000.
MEO2 NO             1.    NO2  1.    CARB1.     MEO21.     X            4000
MEO2 NO             1.    NO2  1.    CARB1.     HO2                    8000.
MEO2 NO                                                                500.
RBO2 O3             2.    CARB1.     HO2                               5.0
RAO2 O3             2.    CARB1.     HO2                               200.
MEO2 O3             1.    CARB1.     HO2                               5.0
CARB OH             0.5   HO2 0.5    CO   0.5   ACO30.5    X           19000.
CARB                1.    CO                                           0.00135
CARB                1.5   HO2 0.5    MEO20.5    X    1.0   CO          0.002025
X    PAR                                                               100000.
ACO3 NO2            1.    PAN                                          2000.
PAN                 1.    NO2  1.    ACO3                              0.028
ACO3 HO2                                                               4000.
MEO2 HO2                                                               4000.
CRIC NO             1.    NO2  1.    CARB                              12000.
CRIC NO2            1.    NO3  1.    CARB                              8000.
CRIC CARB                                                              2000.
MCRC NO             1.    NO2  1.    CARB                              12000.
MCRC NO2            1.    NO3  1.    CARB                              8000.
MCRC CARB                                                              2000.
CRIC                1.    CO                                           670.
CRIC                                                                   200.
CR:C                2.    HO2  1.    CO                                90.
MCRC                                                                   180.
```

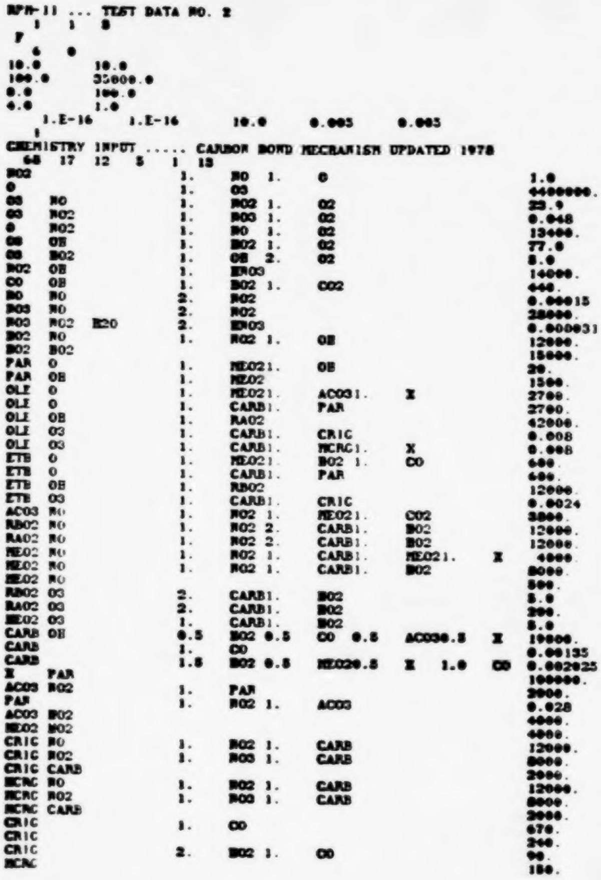
Figure 10. Sample data set No. 1

```
HCHO                1.    HCHO1.   OH  1.   CO  1.   X   940.
HCHO                1.    HO21.    NO2 1.   X           425.
HCHO                1.    CARBC.   NO2 1.   X           60.
ARO  OH             1.    NO2 3.   Y                    10000.
ARO  ON             1.    NO2 1.   HZA 1.   X           1600.
ARO  OH             1.    OH  1.   HZA 1.   W           3000.
W    CARB                                               100000.
Y    NO             1.    NO  1.   CARB1.   PAR         30.
Y    NO             1.    NO2                           15.
Y    NO3            2.    CARB                          33000.
Y    O3             1.    AERO                          0.6
HZA  OH             1.    NO2 3.   Y                    10000.
HZA                 1.    MEO21.   NO2 3.   Y           0.2025
SO2  OH             1.    HSO3                          2000.
HSO3 NO             1.    NO2 1.   HSO4                 800.
HSO4 NO2            1.    AERS1.   HNO3                 10000.
TRAC 1.0          1
TEST 1.0
NO2      4.71E-1  1
NO       2.904    1
O3       5.20E-2
HO2      0.0
CO       7.30E-1  1
PAN      6.00E-6
OLE      8.20E-2  1
CARB     7.80E-2  1
PAR      4.10E-1  1
ARO      1.45E-1  1
SO2      7.22     1
HSO3     0.0
HSO4     0.0
ETH      1.10E-2
HZA      8.70E-6
O        0.0
CRIC
MCRC
OH
RAO2
RBO2
MEO2
ACO3
NO3
Y
X
W
HNO3
CO2
O2
AERS     0.0
AERO     0.0
H2O    19000.
EMISSIONS INPUT
   0
METEOROLOGICAL INPUT
 1 1 1 1 1
   1
6.0
   3
100.0     800.0     1000.0    1000.0    20000.0   20000.0
   3
100.0     250.0     2000.0    1250.0    30000.0   1250.0
   4
0.5       0.0       0.45      60.0      0.8       70.0      0.17      120.0
   3


0.0       75.0      120.0
TEST     1.00      1.00      1.00
NO2      1.00E-2   1.00E-2   1.00E-2
NO       4.00E-3   4.00E-3   4.00E-3
O3       5.00E-2   6.50E-2   7.75E-2
CO       6.00E-1   6.00E-1   6.00E-1
PAN      6.00E-6   6.00E-6   6.00E-6
OLE      1.10E-2   1.10E-2   1.10E-2
CARB     2.00E-2   2.00E-2   2.00E-2
PAR      3.30E-1   3.30E-1   3.30E-1
ARO      1.40E-1   1.40E-1   1.40E-1
ETH      1.10E-2   1.10E-2   1.10E-2
HZA      8.70E-6   8.70E-6   8.70E-6
SO2      2.00E-2   2.00E-2   2.00E-2
  4
NO2  NO   O3   AERS
```

Figure 10 (Concluded).

3.1.7 Discussion of Sample Data Set No. 2

Data Set No. 2 provides input necessary for an ambient simulation. Many of the input variables pertaining to plume simulations are read but not used within the program. These variables include NCELLS, DEFNW, FACTR, NFLAG, and all plume dimension input beyond the first value. Initial species concentrations for the ambient simulation are determined from two sections of the input deck. The species concentrations read in from CHEMIN are used as initial concentrations in the ambient simulation only if NFLAG is not equal to 1. If NFLAG=1, the program looks to the ambient concentrations for an initial value. It is generally good practice to match all initial values in the input deck with the corresponding ambient values, and set NFLAG=0 when running a simulation in the ambient mode (Figure 11).



```
RPM-II ... TEST DATA NO. 2
   1   1   8
 F
   6   0
10.0        10.0
100.0       35000.0
0.0         100.0
4.0         1.0
     1.E-16     1.E-16      10.0      0.005      0.005
   1
CHEMISTRY INPUT ..... CARBON BOND MECHANISM UPDATED 1978
  68   17   12    5    1   13
NO2                       1.    NO  1.    O                              1.0
O                         1.    O3                                       4400000.
O3   NO                   1.    NO2 1.    O2                             23.9
O3   NO2                  1.    NO3 1.    O2                             0.048
O    NO2                  1.    NO  1.    O2                             13400.
O3   OH                   1.    HO2 1.    O2                             77.0
O3   HO2                  1.    OH  2.    O2                             8.0
NO2  OH                   1.    HNO3                                     14000.
CO   OH                   1.    HO2 1.    CO2                            440.
NO   NO                   2.    NO2                                      0.00015
NO3  NO                   2.    NO2                                      28000.
NO3  NO2  H2O             2.    HNO3                                     0.000031
HO2  NO                   1.    NO2 1.    OH                             12000.
HO2  HO2                                                                 15000.
PAR  O                    1.    MEO21.    OH                             20.
PAR  OH                   1.    MEO2                                     1500.
OLE  O                    1.    MEO21.    ACO31.    X                    2700.
OLE  O                    1.    CARB1.    PAR                            2700.
OLE  OH                   1.    RAO2                                     42000.
OLE  O3                   1.    CARB1.    CRIC                           0.008
OLE  O3                   1.    CARB1.    MCRC1.    X                    0.008
ETH  O                    1.    MEO21.    HO2 1.    CO                   600.
ETH  O                    1.    CARB1.    PAR                            600.
ETH  OH                   1.    RBO2                                     12000.
ETH  O3                   1.    CARB1.    CRIC                           0.0024
ACO3 NO                   1.    NO2 1.    MEO21.    CO2                  3000.
RBO2 NO                   1.    NO2 2.    CARB1.    HO2                  12000.
RAO2 NO                   1.    NO2 2.    CARB1.    HO2                  12000.
MEO2 NO                   1.    NO2 1.    CARB1.    MEO21.    X         4000.
MEO2 NO                   1.    NO2 1.    CARB1.    HO2                  8000.
MEO2 NO                                                                  800.
RBO2 O3                   2.    CARB1.    HO2                            5.0
RAO2 O3                   2.    CARB1.    HO2                            200.
MEO2 O3                   1.    CARB1.    HO2                            8.0
CARB OH                   0.5   HO2 0.5   CO   0.5  ACO30.5   X         19000.
CARB                      1.    CO                                       0.00135
CARB                      1.5   HO2 0.5   MEO20.5   X    1.0  CO        0.002025
X    PAR                                                                 100000.
ACO3 NO2                  1.    PAN                                      2000.
PAN                       1.    NO2 1.    ACO3                           0.028
ACO3 HO2                                                                 4000.
MEO2 HO2                                                                 4000.
CRIC NO                   1.    NO2 1.    CARB                           12000.
CRIC NO2                  1.    NO3 1.    CARB                           8000.
CRIC CARB                                                                2000.
MCRC NO                   1.    NO2 1.    CARB                           12000.
MCRC NO2                  1.    NO3 1.    CARB                           8000.
MCRC CARB                                                                2000.
CRIC                      1.    CO                                       670.
CRIC                                                                     240.
CRIC                      2.    HO2 1.    CO                             90.
MCRC                                                                     180.
```

Figure 11. Sample data set No. 2.

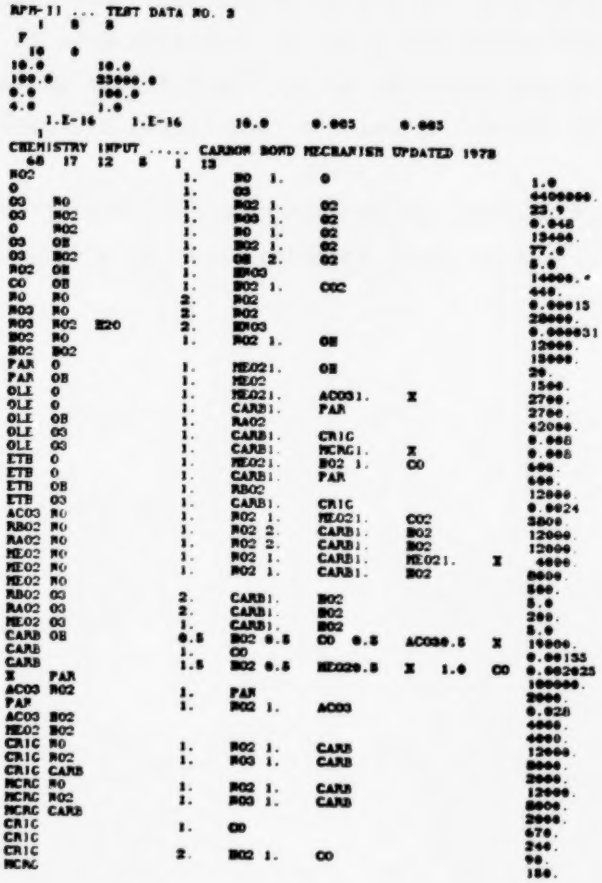
```
MCRC                      1.     MEO21.    OH  1.    CO  1.     X   840.
MCRC                      1.     MEO21.    NO2 1.    X                423.
MCRC                      1.     CARB2     NO2 1.    X                85.
ARO  OH                   1.     NO2 3.    Y                          10000.
ARO  OH                   1.     NO2 1.    BZA 1.    X                1600.
ARO  OH                   1.     OH  1.    BZA 1.    V                3000.
V    CARB                                                             100000.
Y    NO                   1.     NO  1.    CARB1.    PAR              80.
Y    NO                   1.     NO2                                  13.
Y    NO3                  2.     CARB                                 35000.
Y    O3                   1.     AERO                                 0.6
BZA  OH                   1.     NO2 3.    Y                          10000
BZA                       1.     MEO21.    NO2 3.    Y                0.2025
RO2  OH                   1.     RSO5                                 2000.
RSO5 NO                   1.     NO2 1.    RSO4                       800.
RNO4 NO2                  1.     AERS1.    HNO3                       10000.
TRAC 1.0            1
TEST 1.0
NO2       1.00E-2
NO        4.00E-3
O3        8.00E-2
NO3       0.0
CO        6.00E-1
PAN       6.00E-6
OLE       1.10E-2
CARB      2.00E-2
PAR       3.30E-1
ARO       1.40E-1
RO2       2.00E-2
RNO5      0.0
RNO4      0.0
ETH       1.10E-2
BZA       8.70E-6
O         0.0
CRIC
MCRC
OH
RAO2
RBO2
MEO2
ACO3
NO3
Y
X
V
HNO3
CO2
O2
AERS     0.0
AERO     0.0
H2O   19000.
EMISSIONS INPUT
   0
METEOROLOGICAL INPUT
 1 1 1 1 1
   1
4.0
   8
100.0      300.0      1000.0     1000.0     30000.0    30000.0
   8
100.0      250.0      2000.0     1250.0     30000.0    1250.0
   4
0.5        0.0        0.45       60.0       0.8        70.0       0.17       120.0
   8



0.0        73.0       120.0
TEST    1.00       1.00       1.00
NO2     1.00E-2    1.00E-2    1.00E-2
NO      4.00E-3    4.00E-3    4.00E-3
O3      5.00E-2    6.50E-2    7.75E-2
CO      6.00E-1    6.00E-1    6.00E-1
PAN     6.00E-6    6.00E-6    6.00E-6
OLE     1.10E-2    1.10E-2    1.10E-2
CARB    2.00E-2    2.00E-2    2.00E-2
PAR     8.30E-1    8.30E-1    8.30E-1
ARO     1.40E-1    1.40E-1    1.40E-1
ETH     1.10E-2    1.10E-2    1.10E-2
BZA     8.70E-6    8.70E-6    8.70E-6
RO2     2.00E-2    2.00E-2    2.00E-2
 4
NO2   NO    O3    AERS
```

Figure 11. (Concluded).

3.1.8 Discussion of Sample Data Set No. 3

This sample data set provides input for a combined ambient and plume simulation. Program operation first simulates the ambient concentrations and then uses the stored values for input to a plume simulation. Emissions inputs are given in this data set, so the initial concentration values are equal to the first set of ambient values. The remaining sets of ambient values are read in but not used (Figure 12).

Clarification of initial and ambient concentration specifications may be found in Section 4.0, which contains notes on program operation.



```
RPM-II ... TEST DATA NO. 3
   1   8   8
 F
  10   0
10.0       10.0
100.0      35000.0
0.0        100.0
4.0        1.0
    1.E-16    1.E-16       10.0      0.005      0.005
   1
CHEMISTRY INPUT ..... CARBON BOND MECHANISM UPDATED 1978
  68  17  12   5   1  13
NO2                       1.    NO   1.   O                                1.0
O                         1.    O3                                         4400000.
O3   NO                   1.    NO2  1.   O2                               23.9
O3   NO2                  1.    NO3  1.   O2                               0.048
O    NO2                  1.    NO   1.   O2                               13400.
O3   OH                   1.    HO2  1.   O2                               77.0
O3   HO2                  1.    OH   2.   O2                               5.0
NO2  OH                   1.    HNO3                                       14000.
CO   OH                   1.    HO2  1.   CO2                              440.
NO   NO                   2.    NO2                                        0.00015
NO3  NO                   2.    NO2                                        28000.
NO3  NO2  H2O             2.    HNO3                                       0.000031
HO2  NO                   1.    NO2  1.   OH                               12000.
HO2  HO2                                                                   15000.
PAR  O                    1.    MEO21.    OH                               20.
PAR  OH                   1.    MEO2                                       1500.
OLE  O                    1.    MEO21.    AC031.    X                      2700.
OLE  O                    1.    CARB1.    PAR                              2700.
OLE  OH                   1.    RAO2                                       42000.
OLE  O3                   1.    CARB1.    CRIC                             0.008
OLE  O3                   1.    CARB1.    MCRC1.    X                      0.008
ETH  O                    1.    MEO21.    HO2  1.   CO                     600.
ETH  O                    1.    CARB1.    PAR                              600.
ETH  OH                   1.    RBO2                                       12000.
ETH  O3                   1.    CARB1.    CRIC                             0.0024
AC03 NO                   1.    NO2  1.   MEO21.    CO2                    3800.
RBO2 NO                   1.    NO2  2.   CARB1.    HO2                    12000.
RAO2 NO                   1.    NO2  2.   CARB1.    HO2                    12000.
MEO2 NO                   1.    NO2  1.   CARB1.    MEO21.    X             4000.
MEO2 NO                   1.    NO2  1.   CARB1.    HO2                    8000.
MEO2 NO                                                                    500.
RBO2 O3                   2.    CARB1.    HO2                              5.0
RAO2 O3                   2.    CARB1.    HO2                              200.
MEO2 O3                   1.    CARB1.    HO2                              5.0
CARB OH                   0.5   HO2 0.5   CO   0.5  AC030.5   X            19000.
CARB                      1.    CO                                         0.00135
CARB                      1.5   HO2 0.5   MEO20.5   X    1.0  CO           0.002025
X    PAR                                                                   100000.
AC03 NO2                  1.    PAN                                        2000.
PAN                       1.    NO2  1.   AC03                             0.028
AC03 HO2                                                                   4000.
MEO2 HO2                                                                   4000.
CRIC NO                   1.    NO2  1.   CARB                             12000.
CRIC NO2                  1.    NO3  1.   CARB                             8000.
CRIC CARB                                                                  2000.
MCRC NO                   1.    NO2  1.   CARB                             12000.
MCRC NO2                  1.    NO3  1.   CARB                             8000.
MCRC CARB                                                                  2000.
CRIC                      1.    CO                                         670.
CRIC                                                                       240.
CRIC                      2.    HO2  1.   CO                               90.
MCRC                                                                       180.
```

Figure 12. Sample data set No. 3.

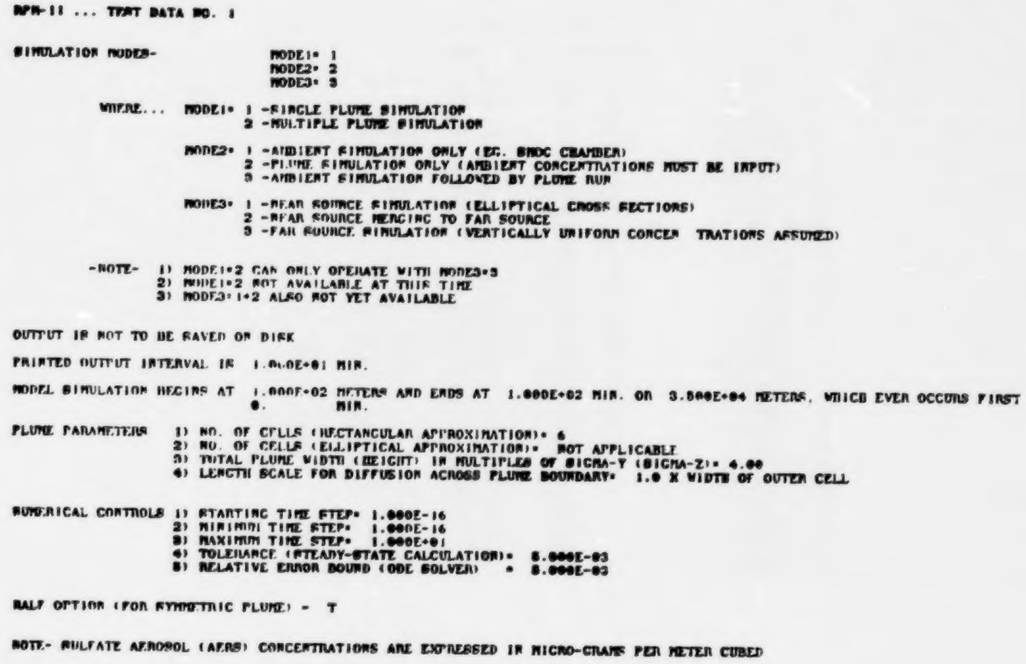
```
MCRG                1.   MEO21.   OH  1.   CO  1.    X   340.
MCRG                1.   MEO21.   NO2 1.   X             425.
MCRG                1.   CARB2.   NO2 1.   X             85.
ARO  OH             1.   NO2 3.   Y                      18000.
ARO  OH             1.   NO2 1.   BZA 1.   X             1600.
ARO  OH             1.   OH  1.   BZA 1.   V             8000.
V    CARB                                                100000.
Y    NO             1.   NO  1.   CARB1.   PAR           80.
Y    NO             1.   NO2                             18.
Y    NO3            2.   CARB                            35000.
Y    O3             1.   AERO                            0.6
BZA  OH             1.   NO2 3.   Y                      10000.
BZA                 1.   MEO21.   NO2 3.   Y             0.2025
SO2  OH             1.   HSO3                            2000.
HSO3 NO             1.   NO2 1.   HSO4                   800.
HSO4 NO2            1.   AERS1.   HNO3                   10000.
TRAC 1.0               1
TEST 1.0
NO2      1.00E-2 1
NO       4.00E-3 1
O3       5.00E-2
HO2      0.0
CO       6.00E-1 1
PAR      6.00E-6
OLE      1.10E-2 1
CARB     2.80E-2 1
PAR      8.30E-1 1
ARO      1.40E-1 1
SO2      2.00E-2 1
HSO3     0.0
HSO4     0.0
ETH      1.10E-2
BZA      8.70E-6
O        0.0
CRIG
MCRG
OH
RAO2
RBO2
MEO2
ACO3
NO3
Y
X
V
HNO3
CO2
O2
AERS     0.0
AERO     0.0
H2O   19000.
EMISSIONS INPUT
   2
200.0          3   2
NO2      8.00E2
NO       7.00E3
SO2      2.00E3
400.0          3   1   1013.25     300.0
NO2    2.0         44.0
NO     8.0         28.0
SO2    75.0        64.0
METEOROLOGICAL INPUT
  1 2 1 1 1
    1




4.0
   2
   3
100.0    250.0    2000.0    1250.0    30000.0   1250.0
   4
0.5      0.0      0.45      40.0      0.3       70.0      0.17      120.0
   3
0.0      75.0     120.0
TEST     1.00      1.00      1.00.
NO2      1.00E-2   1.00E-2   1.00E-2
NO       4.00E-3   4.00E-3   4.00E-3
O3       8.00E-2   6.30E-2   7.75E-2
CO       6.00E-1   6.00E-1   6.00E-1
PAR      6.00E-6   6.00E-6   6.00E-4
OLE      1.10E-2   1.10E-2   1.10E-2
CARB     2.80E-2   2.80E-2   2.80E-2
PAR      8.30E-1   8.30E-1   8.30E-1
ARO      1.40E-1   1.40E-1   1.40E-1
ETH      1.10E-2   1.10E-2   1.10E-2
BZA      8.70E-6   8.70E-6   8.70E-6
SO2      2.00E-2   2.00E-2   2.00E-2
 4
NO2  NO   O3   AERS
```

Figure 12. (Concluded).

3.2 OUTPUT DATA DEFINITION AND STRUCTURE

The output format is nearly self-explanatory. The first page of output shows input parameters read from subroutine INPUT. Notes on the current flexibility of the model simulation types are also indicated; these will be updated as further operation modes are developed. The second page prints input information read from subroutine CHEMIN. Under the heading, Species Type, D refers to differential, S to steady-state, U to uncoupled, and I to inert/constant. Meteorological data read from METIN is shown following the chemical reactions. Subroutine CLLDIM computes cell width and other geometric factors and prints the factors following the ambient species concentrations. The bulk of the output shows species concentrations (plume average ambient, plume average minus ambient, and cell) as well as current time, fetch, plume width and depth, sigma-y, wind speed, photolysis rate constant, cell dimensions, and equivalent diffusivities. These are printed at user-specified intervals. Finally, for user selected species, concentrations for the entire simulation are graphically illustrated in printer plot form. The output of RPM-II, using the sample input Deck No. 1 (discussed in Section 3.1.1), is shown in Figure 13.

Output for the ambient simulation (using Data Set No. 2 discussed in Section 3.1.2) is presented in Figure 14. The structure of this output is similar to the plume simulation output of Sample No. 1 (Figure 12), except that references to the plume geometry and plume concentrations are omitted. Although ambient data read from METIN consisted of concentrations at several different times, only those for the initial time have been used in the simulation. The same holds true for plume widths and depths. In other words, the model assumes that the dimensions of the reaction chamber are those given as initial dimensions. For the ambient simulation, these dimensions are arbitrary.



```
RPM-II ... TEST DATA NO. 1

SIMULATION MODES-              MODE1= 1
                               MODE2= 2
                               MODE3= 3

         WHERE...   MODE1= 1 -SINGLE PLUME SIMULATION
                           2 -MULTIPLE PLUME SIMULATION

                    MODE2= 1 -AMBIENT SIMULATION ONLY (EG. SMOG CHAMBER)
                           2 -PLUME SIMULATION ONLY (AMBIENT CONCENTRATIONS MUST BE INPUT)
                           3 -AMBIENT SIMULATION FOLLOWED BY PLUME RUN

                    MODE3= 1 -NEAR SOURCE SIMULATION (ELLIPTICAL CROSS SECTIONS)
                           2 -NEAR SOURCE MERGING TO FAR SOURCE
                           3 -FAR SOURCE SIMULATION (VERTICALLY UNIFORM CONCEN  TRATIONS ASSUMED)

        -NOTE-  1) MODE1=2 CAN ONLY OPERATE WITH MODE3=3
                2) MODE1=2 NOT AVAILABLE AT THIS TIME
                3) MODE3=1+2 ALSO NOT YET AVAILABLE

OUTPUT IS NOT TO BE SAVED ON DISK

PRINTED OUTPUT INTERVAL IS  1.000E+01 MIN.

MODEL SIMULATION BEGINS AT  1.000E-02 METERS AND ENDS AT  1.000E+02 MIN. OR  3.500E+04 METERS, WHICH EVER OCCURS FIRST
                            0.        MIN.

PLUME PARAMETERS   1) NO. OF CELLS (RECTANGULAR APPROXIMATION)= 6
                   2) NO. OF CELLS (ELLIPTICAL APPROXIMATION)=  NOT APPLICABLE
                   3) TOTAL PLUME WIDTH (HEIGHT) IN MULTIPLES OF SIGMA-Y (SIGMA-Z)= 4.00
                   4) LENGTH SCALE FOR DIFFUSION ACROSS PLUME BOUNDARY=  1.0 X WIDTH OF OUTER CELL

NUMERICAL CONTROLS 1) STARTING TIME STEP= 1.000E-16
                   2) MINIMUM TIME STEP=  1.000E-16
                   3) MAXIMUM TIME STEP=  1.000E+01
                   4) TOLERANCE (STEADY-STATE CALCULATION)=  5.000E-03
                   5) RELATIVE ERROR BOUND (ODE SOLVER)   =  5.000E-03

HALF OPTION (FOR SYMMETRIC PLUME) -  T

NOTE- SULFATE AEROSOL (AERS) CONCENTRATIONS ARE EXPRESSED IN MICRO-GRAMS PER METER CUBED
```

Figure 13. Sample Output No. 1.

```
CHEMISTRY INPUT ..... CARBON BOND MECHANISM UPDATED 1978

NUMBER OF REACTIONS                          -  60
NUMBER OF DIFFERENTIAL SPECIES (D)           -  17
NUMBER OF STEADY-STATE SPECIES (S)           -  12
NUMBER OF UNCOUPLED SPECIES (U)              -   5
NUMBER OF INERT OR CONSTANT SPECIES (I)-         1
NUMBER OF ENTRAINED SPECIES                  -  18

 SPECIES  SPECIES  SPECIES      SPECIES  SPECIES  SPECIES      SPECIES  SPECIES  SPECIES      SPECIES  SPECIES  SPECIES
   NO.     NAME     TYPE          NO.     NAME     TYPE          NO.     NAME     TYPE          NO.     NAME     TYPE

    1      TRAC      D             2      TEST      D             3      NO2       D             4      NO        D
    5      O3        D             6      HO2       D             7      CO        D             8      PAN       D
    9      OLE       D            10      CARB      D            11      PAR       D            12      ARO       D
   13      SO2       D            14      HSO3      D            15      HSO4      D            16      ETH       D
   17      BZA       D            18      O         S            19      CRIC      S            20      MCRC      S
   21      OH        S            22      RAO2      S            23      RBO2      S            24      MEO2      S
   25      ACO3      S            26      NO3       S            27      Y         S            28      X         S
   29      W         S            30      HNO3      U            31      CO2       U            32      O2        U
   33      AERS      U            34      AERO      U            35      H2O       I

                                          CHEMICAL REACTIONS

          RATE CONST.          REACTANTS            PRODUCTS

     1   1.000E+00                  NO2 =   1.00 NO     1.00 O
     2   4.400E+06                  O   =   1.00 O3
     3   2.390E+01            NO    O3  =   1.00 NO2    1.00 O2
     4   4.800E-02            NO2   O3  =   1.00 NO3    1.00 O2
     5   1.340E+04            NO2   O   =   1.00 NO     1.00 O2
     6   7.700E+01            OH    O3  =   1.00 HO2    1.00 O2
     7   5.000E+00            HO2   O3  =   1.00 OH     2.00 O2
     8   1.400E+04            OH    NO2 =   1.00 HNO3
     9   4.400E+02            OH    CO  =   1.00 HO2    1.00 CO2
    10   1.500E-04            NO    NO  =   2.00 NO2
    11   2.800E+04            NO    NO3 =   2.00 NO2
    12   3.100E-05      H2O   NO2   NO3 =   2.00 HNO3
    13   1.200E+04            NO    HO2 =   1.00 NO2    1.00 OH
    14   1.500E+04            HO2   HO2 =   0.00
    15   2.000E+01            O     PAR =   1.00 MEO2   1.00 OH
    16   1.500E+03            OH    PAR =   1.00 MEO2
    17   2.700E+03            O     OLE =   1.00 MEO2   1.00 ACO3   1.00 X
    18   2.700E+03            O     OLE =   1.00 CARB   1.00 PAR
    19   4.200E+04            OH    OLE =   1.00 RAO2
    20   8.000E-03            O3    OLE =   1.00 CARB   1.00 CRIC
    21   8.000E-03            O3    OLE =   1.00 CARB   1.00 MCRC   1.00 X
    22   6.000E+02            O     ETH =   1.00 MEO2   1.00 HO2    1.00 CO
    23   6.000E+02            O     ETH =   1.00 CARB   1.00 PAR
    24   1.200E+04            OH    ETH =   1.00 RBO2
    25   2.400E-03            O3    ETH =   1.00 CARB   1.00 CRIC
    26   3.800E+03            NO    ACO3=   1.00 NO2    1.00 MEO2   1.00 CO2
    27   1.200E+04            NO    RBO2=   1.00 NO2    2.00 CARB   1.00 HO2
    28   1.200E+04            NO    RAO2=   1.00 NO2    2.00 CARB   1.00 HO2
    29   4.000E+03            NO    MEO2=   1.00 NO2    1.00 CARB   1.00 MEO2   1.00 X
    30   8.000E+03            NO    MEO2=   1.00 NO2    1.00 CARB   1.00 HO2
    31   5.000E+02            NO    MEO2=   0.00
    32   5.000E+06            O3    RBO2=   2.00 CARB   1.00 HO2
    33   2.000E+02            O3    RAO2=   2.00 CARB   1.00 HO2
    34   5.000E+06            O3    MEO2=   1.00 CARB   1.00 HO2
    35   1.900E+04            OH    CARB=    .50 HO2     .50 CO      .50 ACO3    .50 X
    36   1.350E-03                  CARB=   1.00 CO
    37   2.025E-03                  CARB=   1.50 HO2     .50 MEO2    .50 X      1.00 CO
    38   1.000E-05            PAR   X   =   0.00
```

Figure 13 (Continued).

```
39  2.000E+03        NO2  ACO3=  1.00 PAN
40  2.000E-02             PAN =  1.00 NO2   1.00 ACO3
41  4.000E+03        RO2  ACO3=  0.00
42  4.000E+03        RO2  MEO2=  0.00
43  1.200E+04        NO   CRIG=  1.00 NO2   1.00 CARB
44  8.000E+03        NO2  CRIG=  1.00 NO3   1.00 CARB
45  2.000E+03        CARB CRIG=  0.00
46  1.200E+04        NO   MCRG=  1.00 NO2   1.00 CARB
47  8.000E+03        NO2  MCRG=  1.00 NO3   1.00 CARB
48  2.000E+03        CARB MCRG=  0.00
49  6.700E+02             CRIG=  1.00 CO
50  2.400E+02             CRIG=  0.00
51  9.000E+01             CRIG=  2.00 HO2   1.00 CO
52  1.500E+02             MCRG=  0.00
53  3.400E+02             MCRG=  1.00 MEO2  1.00 OH    1.00 CO     1.00 X
54  4.250E+02             MCRG=  1.00 MEO2  1.00 HO2   1.00 X
55  8.500E+01             MCRG=  1.00 CARB  2.00 HO2   1.00 X
56  1.000E+04        OH   ARO =  1.00 HO2   3.00 Y
57  1.600E+03        OH   ARO =  1.00 HO2   1.00 BZA   1.00 X
58  5.000E+03        OH   ARO =  1.00 OH    1.00 BZA   1.00 W
59  1.000E+05        CARB W   =  0.00
60  3.000E+01        NO   Y   =  1.00 NO    1.00 CARB  1.00 PAR
61  1.500E+01        NO   Y   =  1.00 NO2
62  3.500E+04        NO3  Y   =  2.00 CARB
63  6.000E-01        O3   Y   =  1.00 AERO
64  1.000E+04        OH   BZA =  1.00 HO2   3.00 Y
65  2.025E-01             BZA =  1.00 MEO2  1.00 HO2   3.00 Y
66  2.000E+03        OH   SO2 =  1.00 HSO5
67  8.000E+02        NO   HSO5=  1.00 NO2   1.00 HSO4
68  1.000E+04        NO2  HSO4=  1.00 AERS  1.00 HNO3
```

Figure 13 (Continued).

```
METEOROLOGICAL INPUT

OPTIONS- WNDOPT-  1
         MDNOPT-  1
         WDNOPT-  1
          K1OPT-  1
         AMBOPT-  1

                              WIND SPEED        TIME
                               (M/SEC)          (MIN)

                                 4.0             0.0

                              PLUME WIDTH   DOWNWIND DISTANCE
                                 (M)              (KM)

                                500.0             .1
                               1000.0            1.0
                              20000.0           30.0

                              MIXING DEPTH  DOWNWIND DISTANCE
                                 (M)              (KM)

                                250.0             .1
                               1250.0            2.0
                               1250.0           30.0

                              K1 FACTOR          TIME
                              (/MIN)            (MIN)

                              5.000E-01          0.0
                              4.500E-01         40.0
                              3.000E-01         70.0
                              1.700E-01        120.0

                              AMBIENT CONCENTRATIONS (PPM)

              SPECIES         TIMES (MIN)

                                  0.        75.       120.
                TEST          1.00E+00  1.00E+00  1.00E+00
                NO2           1.00E-02  1.00E-02  1.00E-02
                NO            4.00E-03  4.00E-03  4.00E-03
                O3            5.23E-02  6.50E-02  7.75E-02
                CO            6.00E-01  6.00E-01  6.00E-01
                PAN           6.00E-06  6.00E-06  6.00E-06
                OLE           1.10E-02  1.10E-02  1.10E-02
                CARB          2.00E-02  2.00E-02  2.00E-02
                PAR           3.30E-01  3.30E-01  3.30E-01
                ARO           1.40E-01  1.40E-01  1.40E-01
                ETH           1.10E-02  1.10E-02  1.10E-02
                BZA           8.70E-06  8.70E-06  8.70E-06
                RO2           2.00E-02  2.00E-02  2.00E-02





PLUME GEOMETRY
CELL NO.   1  WIDTH FACTOR-   1.092E+00, CENTERLINE FACTOR-  -1.454E+00, BOUNDARY FACTOR-  -2.000E+00
CELL NO.   2  WIDTH FACTOR-   4.984E-01, CENTERLINE FACTOR-  -6.592E-01, BOUNDARY FACTOR-  -9.004E-01
CELL NO.   3  WIDTH FACTOR-   4.100E-01, CENTERLINE FACTOR-  -2.050E-01, BOUNDARY FACTOR-  -4.100E-01
CELL NO.   4  WIDTH FACTOR-   4.100E-01, CENTERLINE FACTOR-   2.050E-01, BOUNDARY FACTOR-   0.
CELL NO.   5  WIDTH FACTOR-   4.984E-01, CENTERLINE FACTOR-   6.592E-01, BOUNDARY FACTOR-   4.100E-01
CELL NO.   6  WIDTH FACTOR-   1.092E+00, CENTERLINE FACTOR-   1.454E+00, BOUNDARY FACTOR-   9.004E-01
INDEX NO.  7                                                             BOUNDARY FACTOR-   2.000E+00
```

Figure 13 (Continued).

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------------------------------------------------------------------------------------------------------------------------

 TIME= 0.        MIN.             PLUME WIDTH= 5.000E+02 M.     SIGMA Y= 1.250E+02 M.      WIND SPEED= 4.00E+00 M/SEC
FETCH= 1.00E+02 METERS            PLUME DEPTH= 2.500E+02 M.                                  KZ FACTOR= 5.00E-01
AERO CONC. IN MICRO-G/M**3


                                                                        CELLS
                          PLUME      PLUME-    ------------------------------------------------------------------------
 SPECIES      AMBIENT     AVE.        AMB          1        2        3        4        5        6        7        8        9       10
 1 TRAC  (D) 0.         1.00E+00  1.000E+00   6.11E-01 1.34E+00 1.63E+00 1.63E+00 1.34E+00 6.11E-01
 2 TEST  (D) 1.00E+00   1.00E+00  0.          1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2   (D) 1.00E-02   4.71E-01  4.610E-01   2.92E-01 6.27E-01 7.60E-01 7.60E-01 6.27E-01 2.92E-01
 4 NO    (D) 4.00E-03   2.90E+00  2.896E+00   1.78E+00 3.80E+00 4.72E+00 4.72E+00 3.80E+00 1.78E+00
 5 O3    (D) 5.23E-02   3.39E-03 -4.891E-02   3.44E-03 3.38E-03 3.37E-03 3.37E-03 3.38E-03 3.44E-03
 6 HO2   (D) 0.         0.        0.          0.       0.       0.       0.       0.       0.
 7 CO    (D) 6.00E-01   7.30E-01  1.300E-01   6.79E-01 7.74E-01 8.11E-01 8.11E-01 7.74E-01 6.79E-01
 8 PAN   (D) 6.00E-06   6.00E-06  0.          6.00E-06 6.00E-06 6.00E-06 6.00E-06 6.00E-06 6.00E-06
 9 OLE   (D) 1.10E-02   5.20E-02  4.100E-02   3.60E-02 6.58E-02 7.77E-02 7.77E-02 6.58E-02 3.60E-02
10 CARB  (D) 2.80E-02   7.50E-02  4.700E-02   5.67E-02 9.09E-02 1.04E-01 1.04E-01 9.09E-02 5.67E-02
11 PAR   (D) 3.30E-01   4.10E-01  8.000E-02   3.79E-01 4.37E-01 4.60E-01 4.60E-01 4.37E-01 3.79E-01
12 ARO   (D) 1.40E-01   1.45E-01  5.000E-03   1.43E-01 1.47E-01 1.48E-01 1.48E-01 1.47E-01 1.43E-01
13 SO2   (D) 2.00E-02   7.22E+00  7.200E+00   4.42E+00 9.65E+00 1.17E+01 1.17E+01 9.65E+00 4.42E+00
14 HNO5  (D) 0.         0.        0.          0.       0.       0.       0.       0.       0.
15 HSO4  (D) 0.         0.        0.          0.       0.       0.       0.       0.       0.
16 ETH   (D) 1.10E-02   1.10E-02  0.          1.10E-02 1.10E-02 1.10E-02 1.10E-02 1.10E-02 1.10E-02
17 BZA   (D) 8.70E-06   8.70E-06  0.          8.70E-06 8.70E-06 8.70E-06 8.70E-06 8.70E-06 8.70E-06
18 O     (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
19 CRIC  (S) 0.         0.        0.          0.       0.       0.       0.       0.       0.
20 MCRG  (S) 0.         0.        0.          0.       0.       0.       0.       0.       0.
21 OH    (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
22 RAO2  (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
23 RBO2  (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
24 MEO2  (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
25 ACO3  (S) 0.         0.        0.          0.       0.       0.       0.       0.       0.
26 NO3   (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
27 Y     (S) 0.         0.        0.          0.       0.       0.       0.       0.       0.
28 X     (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
29 W     (R) 0.         0.        0.          0.       0.       0.       0.       0.       0.
30 HNO3  (U) 0.         0.        0.          0.       0.       0.       0.       0.       0.
31 CO2   (U) 0.         0.        0.          0.       0.       0.       0.       0.       0.
32 O2    (U) 0.         0.        0.          0.       0.       0.       0.       0.       0.
33 AERS  (U) 0.         0.        0.          0.       0.       0.       0.       0.       0.
34 AERO  (U) 0.         0.        0.          0.       0.       0.       0.       0.       0.
35 H2O   (I) 0.         1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                 CELLS
                          ----------------------------------------------------------------------------------------------
                               1          2          3          4          5          6          7        8        9       10
      CELL DEPTHS (M)      2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02
      CELL WIDTHS (M)      1.36E+02   6.23E+01   5.12E+01   5.12E+01   6.23E+01   1.36E+02
CELL CENTERLINES (M)      -1.82E+02  -8.24E+01  -2.56E+01   2.56E+01   8.24E+01   1.82E+02

 CELL BOUNDARIES (M)   -2.50E+02 -1.14E+02 -5.12E+01  0.        5.12E+01  1.14E+02  2.50E+02
DIFFUSIVITIES (M2/S)    0.        0.        0.        0.        0.        0.        0.
```

Figure 13 (Continued).

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--------------------------------------------------------------------------------------------------------------------------

 TIME= 1.00E+01 MIN.          PLUME WIDTH= 1.907E+03 M.      SIGMA Y= 4.968E+02 M.      WIND SPEED= 4.00E+00 M/SEC
FETCH= 2.00E+03 METERS        PLUME DEPTH= 1.245E+03 M.                                  KI FACTOR= 4.93E-01
AERO CONC. IN MICRO-G/M**3

                              PLUME     PLUME-                                       CELLS
  SPECIES        AMBIENT      AVE.       AMB      ----------------------------------------------------------------------------------------
                                                      1        2        3        4        5        6        7        8        9       10
 1 TRAC  (D) 0.          6.02E-02  6.020E-02   3.07E-02 6.71E-02 8.16E-02 8.16E-02 6.71E-02 3.07E-02
 2 TEST  (D) 1.00E+00  1.00E+00 -9.237E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2   (D) 1.00E-02  6.96E-02  5.962E-02   5.64E-02 8.19E-02 8.97E-02 8.97E-02 8.19E-02 5.64E-02
 4 NO    (D) 4.00E-03  1.13E-01  1.087E-01   6.03E-02 1.87E-01 1.90E-01 1.90E-01 1.87E-01 6.03E-02
 5 O3    (D) 5.40E-02  1.63E-02 -3.766E-02   2.13E-02 1.11E-02 9.37E-03 9.37E-03 1.11E-02 2.13E-02
 6 HO2   (D) 0.          3.04E-07  3.041E-07   4.60E-07 1.33E-07 9.79E-08 9.79E-08 1.33E-07 4.60E-07
 7 CO    (D) 6.00E-01  6.07E-01  6.882E-03   6.04E-01 6.09E-01 6.11E-01 6.11E-01 6.09E-01 6.04E-01
 8 PAN   (D) 6.00E-06  1.67E-05  1.065E-05   1.82E-05 1.53E-05 1.41E-05 1.41E-05 1.53E-05 1.82E-05
 9 OLE   (D) 1.10E-02  1.29E-02  1.947E-03   1.22E-02 1.36E-02 1.42E-02 1.42E-02 1.36E-02 1.22E-02
10 CARB  (D) 2.80E-02  3.13E-02  3.339E-03   3.04E-02 3.21E-02 3.20E-02 3.20E-02 3.21E-02 3.04E-02
11 PAR   (D) 3.30E-01  3.34E-01  4.404E-03   3.33E-01 3.36E-01 3.37E-01 3.37E-01 3.36E-01 3.33E-01
12 ARO   (D) 1.40E-01  1.40E-01 -2.536E-04   1.40E-01 1.40E-01 1.40E-01 1.40E-01 1.40E-01 1.40E-01
13 SO2   (D) 2.00E-02  3.81E-01  3.613E-01   2.41E-01 5.03E-01 6.00E-01 6.00E-01 5.03E-01 2.41E-01
14 HNO3  (D) 0.          4.20E-07  4.204E-07   5.40E-07 2.87E-07 2.43E-07 2.43E-07 2.87E-07 5.40E-07
15 HNO4  (D) 0.          4.53E-08  4.534E-08   4.60E-08 4.40E-08 4.29E-08 4.29E-08 4.40E-08 4.60E-08
16 ETH   (D) 1.10E-02  1.10E-02 -2.320E-05   1.10E-02 1.10E-02 1.10E-02 1.10E-02 1.10E-02 1.10E-02
17 HZA   (D) 8.70E-06  8.67E-05  7.804E-05   8.99E-05 8.40E-05 8.07E-05 8.07E-05 8.40E-05 8.99E-05
18 O     (S) 0.          7.79E-09  7.792E-09   6.32E-09 9.17E-09 1.00E-08 1.00E-08 9.17E-09 6.32E-09
19 CRIG  (S) 0.          8.12E-10  8.124E-10   1.10E-09 4.10E-10 3.16E-10 3.16E-10 4.10E-10 1.10E-09
20 MCRG  (S) 0.          6.43E-10  6.437E-10   9.20E-10 3.36E-10 2.66E-10 2.66E-10 3.36E-10 9.20E-10
21 OH    (S) 0.          4.56E-08  4.557E-08   5.53E-08 3.50E-08 3.17E-08 3.17E-08 3.50E-08 5.53E-08
22 HAO2  (S) 0.          2.55E-08  2.553E-08   3.00E-08 1.09E-08 7.96E-09 7.96E-09 1.09E-08 3.00E-08
23 RNO2  (S) 0.          6.48E-09  6.484E-09   1.81E-08 2.50E-09 1.76E-09 1.76E-09 2.50E-09 1.81E-08
24 MEO2  (S) 0.          8.39E-08  8.392E-08   1.25E-07 3.92E-08 2.95E-08 2.95E-08 3.92E-08 1.25E-07
25 ACO3  (S) 0.          3.20E-08  3.204E-08   4.09E-08 1.84E-08 1.14E-08 1.14E-08 1.84E-08 4.09E-08
26 NO3   (S) 0.          2.30E-08  2.297E-08   3.47E-08 1.00E-08 7.36E-09 7.36E-09 1.00E-08 3.47E-08
27 Y     (S) 0.          1.03E-04  1.020E-04   1.60E-04 4.13E-05 2.93E-05 2.93E-05 4.13E-05 1.60E-04
28 X     (S) 0.          2.06E-09  2.064E-09   2.30E-09 1.83E-09 1.73E-09 1.73E-09 1.83E-09 2.30E-09
29 S     (S) 0.          6.15E-09  6.149E-09   7.61E-09 4.67E-09 4.86E-09 4.86E-09 4.67E-09 7.61E-09
30 HNO3  (U) 0.          3.60E-04  3.597E-04   2.90E-04 4.25E-04 4.67E-04 4.67E-04 4.25E-04 2.90E-04
31 CO2   (U) 0.          8.53E-05  8.533E-05   8.26E-05 8.80E-05 8.84E-05 8.84E-05 8.80E-05 8.26E-05
32 O2    (U) 0.          2.63E-01  2.628E-01   1.91E-01 3.27E-01 3.75E-01 3.75E-01 3.27E-01 1.91E-01
33 AERS  (U) 0.          6.20E-01  6.200E-01   4.50E-01 7.67E-01 8.73E-01 8.73E-01 7.67E-01 4.50E-01
34 AERO  (U) 0.          2.69E-06  2.694E-06   3.00E-06 1.65E-06 9.27E-07 9.27E-07 1.65E-06 3.00E-06
35 H2O   (U) 0.          1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                    CELLS
                               ----------------------------------------------------------------------------------------
                                   1          2          3          4          5          6         7        8        9       10
       CELL DEPTHS (M)          1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
       CELL WIDTHS (M)          5.42E+02   2.40E+02   2.04E+02   2.04E+02   2.40E+02   5.42E+02
  CELL CENTERLINES (M)         -7.22E+02  -3.27E+02  -1.02E+02   1.02E+02   3.27E+02   7.22E+02

   CELL BOUNDARIES (M)   -9.94E+02 -4.81E+02 -2.04E+02  0.          2.04E+02  4.81E+02  9.94E+02
  DIFFUSIVITIES (M2/S)    0.         1.97E+02  2.81E+02  0.          2.81E+02  1.97E+02  0.
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Figure 13 (Continued).

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 TIME= 2.00E+01 MIN           PLUME WIDTH= 3.559E+03 M.     SIGMA Y= 5.098E+02 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 4.80E+03 METERS        PLUME DEPTH= 1.246E+03 M.                                K1 FACTOR= 4.79E-01
AERO CONC. IN MICRO-G/M**3

                                                                                   CELLS
                               PLUME      PLUME-     -----------------------------------------------------------------------------
  SPECIES       AMBIENT        AVE.       AMB           1        2        3        4        5        6        7        8        9       10
  1 TRAC  (D) 0.            2.03E-02  2.025E-02    1.73E-02 3.70E-02 4.59E-02 4.59E-02 3.70E-02 1.73E-02
  2 TEST  (D) 1.00E+00      1.00E+00 -7.105E-14    1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
  3 NO2   (D) 1.00E-02      5.60E-02  4.601E-02    4.43E-02 6.72E-02 7.37E-02 7.37E-02 6.72E-02 4.43E-02
  4 NO    (D) 4.00E-03      5.20E-02  4.796E-02    2.69E-02 7.26E-02 9.35E-02 9.35E-02 7.26E-02 2.69E-02
  5 O3    (D) 5.37E-02      2.40E-02 -2.971E-02    3.31E-02 1.89E-02 1.50E-02 1.50E-02 1.89E-02 3.31E-02
  6 HO2   (D) 0.            1.20E-06  1.200E-06    1.84E-06 4.91E-07 3.40E-07 3.40E-07 4.91E-07 1.84E-06
  7 CO    (D) 6.00E-01      6.04E-01  4.267E-03    6.03E-01 6.06E-01 6.07E-01 6.07E-01 6.06E-01 6.03E-01
  8 PAN   (D) 6.00E-06      6.47E-05  5.867E-05    7.13E-05 5.93E-05 5.35E-05 5.35E-05 5.93E-05 7.13E-05
  9 OLE   (D) 1.10E-02      1.18E-02  7.973E-04    1.14E-02 1.22E-02 1.28E-02 1.28E-02 1.22E-02 1.14E-02
 10 CARB  (D) 3.00E-02      3.33E-02  3.306E-03    3.26E-02 3.39E-02 3.43E-02 3.43E-02 3.39E-02 3.26E-02
 11 PAR   (D) 3.30E-01      3.34E-01  4.310E-03    3.33E-01 3.35E-01 3.36E-01 3.36E-01 3.35E-01 3.33E-01
 12 ARO   (D) 1.40E-01      1.38E-01 -1.771E-03    1.38E-01 1.38E-01 1.38E-01 1.38E-01 1.38E-01 1.38E-01
 13 SO2   (D) 2.00E-02      2.23E-01  2.030E-01    1.44E-01 2.92E-01 3.30E-01 3.30E-01 2.92E-01 1.44E-01
 14 H2O2  (D) 0.            1.04E-06  1.039E-06    1.42E-06 6.05E-07 5.60E-07 5.60E-07 6.05E-07 1.42E-06
 15 HNO4  (D) 0.            6.40E-08  6.399E-08    6.88E-08 5.92E-08 5.69E-08 5.69E-08 5.92E-08 6.88E-08
 16 ETH   (D) 1.10E-02      1.09E-02 -8.632E-05    1.09E-02 1.09E-02 1.09E-02 1.09E-02 1.09E-02 1.09E-02
 17 HZA   (D) 8.70E-06      2.51E-04  2.424E-04    2.59E-04 2.47E-04 2.36E-04 2.36E-04 2.47E-04 2.59E-04
 18 O     (S) 0.            6.09E-09  6.092E-09    4.81E-09 7.31E-09 8.02E-09 8.02E-09 7.31E-09 4.81E-09
 19 CRIG  (S) 0.            1.89E-09  1.894E-09    2.22E-09 9.41E-10 7.18E-10 7.18E-10 9.41E-10 2.22E-09
 20 MCRG  (S) 0.            1.24E-09  1.243E-09    1.73E-09 7.41E-10 5.66E-10 5.66E-10 7.41E-10 1.73E-09
 21 OH    (S) 0.            8.76E-08  8.760E-08    1.07E-07 6.03E-08 5.99E-08 5.99E-08 6.03E-08 1.07E-07
 22 HNO2  (S) 0.            9.97E-08  9.974E-08    1.64E-07 3.97E-08 2.79E-08 2.79E-08 3.97E-08 1.64E-07
 23 [illegible] (S) 0.      2.75E-08  2.751E-08    4.31E-08 1.02E-08 6.90E-09 6.90E-09 1.02E-08 4.31E-08
 24 MEO2  (S) 0.            3.31E-07  3.300E-07    4.90E-07 1.40E-07 1.07E-07 1.07E-07 1.40E-07 4.90E-07
 25 ACO3  (S) 0.            1.24E-07  1.238E-07    1.04E-07 5.81E-08 4.23E-08 4.23E-08 5.81E-08 1.04E-07
 26 RO3   (S) 0.            6.21E-08  6.203E-08    9.18E-08 3.02E-08 2.18E-08 2.18E-08 3.02E-08 9.18E-08
 27 Y     (S) 0.            4.40E-04  4.396E-04    6.00E-04 1.74E-04 1.21E-04 1.21E-04 1.74E-04 6.00E-04
 28 X     (S) 0.            3.44E-09  3.441E-09    3.93E-09 2.96E-09 2.74E-09 2.74E-09 2.96E-09 3.93E-09
 29 S     (S) 0.            1.10E-08  1.097E-08    1.36E-08 8.34E-09 7.24E-09 7.24E-09 8.34E-09 1.36E-08
 30 HNO3  (U) 0.            8.90E-04  8.904E-04    7.26E-04 1.06E-03 1.16E-03 1.16E-03 1.06E-03 7.26E-04
 31 CO2   (U) 0.            3.03E-04  3.028E-04    2.07E-04 3.20E-04 3.23E-04 3.23E-04 3.20E-04 2.07E-04
 32 O2    (U) 0.            3.92E-01  3.919E-01    2.75E-01 4.97E-01 5.75E-01 5.75E-01 4.97E-01 2.75E-01
 33 AERS  (U) 0.            1.27E+00  1.271E+00    9.39E-01 1.57E+00 1.79E+00 1.79E+00 1.57E+00 9.39E-01
 34 AERO  (U) 0.            3.49E-05  3.490E-05    4.94E-05 2.10E-05 1.32E-05 1.32E-05 2.10E-05 4.94E-05
 35 H2O   (I) 0.            1.90E+04  1.900E+04    1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                          CELLS
                          ------------------------------------------------------------------------------------------
                               1          2          3          4          5          6          7        8        9       10
      CELL DEPTHS (M)      1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
      CELL WIDTHS (M)      9.71E+02   4.44E+02   3.65E+02   3.65E+02   4.44E+02   9.71E+02
CELL CENTERLINES (M)      -1.29E+03  -5.87E+02  -1.82E+02   1.82E+02   5.87E+02   1.29E+03

 CELL BOUNDARIES (M)  -1.78E+03 -8.08E+02 -3.65E+02  0.         3.65E+02  8.08E+02  1.78E+03
DIFFUSIVITIES (M2/S)   0.        5.84E+02  5.03E+02  0.         5.03E+02  5.84E+02  0.
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Figure 13 (Continued).

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 TIME= 3.00E+01 MIN.             PLUME WIDTH= 5.131E+03 M.     SIGMA Y= 1.283E+03 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 7.30E+03 METERS           PLUME DEPTH= 1.246E+03 M.                                 KI FACTOR= 4.64E-01
AERS CONC. IN MICRO-G/M**3

                                                                                   CELLS
                             PLUME      PLUME-     -----------------------------------------------------------------------------------
  SPECIES       AMBIENT      AVE.        AMB          1        2        3        4        5        6         7        8        9       10
 1 TRAC  (D) 0.           1.95E-02   1.949E-02   1.19E-02 2.61E-02 3.17E-02 3.17E-02 2.61E-02 1.19E-02
 2 TEST  (D) 1.00E+00  1.00E+00  -6.398E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2   (D) 1.00E-02  4.92E-02   3.919E-02   3.75E-02 6.02E-02 6.70E-02 6.70E-02 6.02E-02 3.75E-02
 4 NO    (D) 4.00E-03  2.84E-02   2.443E-02   1.49E-02 3.93E-02 5.13E-02 5.13E-02 3.93E-02 1.49E-02
 5 O3    (D) 5.74E-02  3.74E-02  -2.000E-02   4.86E-02 2.98E-02 2.80E-02 2.80E-02 2.98E-02 4.86E-02
 6 HNO2  (D) 0.           3.38E-06   3.384E-06   5.15E-06 1.39E-06 9.51E-07 9.51E-07 1.39E-06 5.15E-06
 7 CO    (D) 6.00E-01  6.04E-01   3.516E-03   6.02E-01 6.05E-01 6.05E-01 6.05E-01 6.05E-01 6.02E-01
 8 PAR   (D) 6.00E-06  1.89E-04   1.827E-04   2.09E-04 1.73E-04 1.88E-04 1.88E-04 1.73E-04 2.09E-04
 9 OLE   (D) 1.10E-02  1.10E-02   4.015E-05   1.08E-02 1.13E-02 1.15E-02 1.15E-02 1.13E-02 1.08E-02
10 CARB  (D) 2.00E-02  3.01E-02   1.012E-02   2.74E-02 3.09E-02 3.91E-02 3.91E-02 3.09E-02 2.74E-02
11 PAN   (D) 3.30E-01  3.36E-01   6.331E-03   3.36E-01 3.37E-01 3.37E-01 3.37E-01 3.37E-01 3.36E-01
12 ARO   (D) 1.40E-01  1.36E-01  -4.220E-03   1.36E-01 1.36E-01 1.36E-01 1.36E-01 1.36E-01 1.36E-01
13 SO2   (D) 2.00E-02  1.60E-01   1.398E-01   1.05E-01 2.07E-01 2.47E-01 2.47E-01 2.07E-01 1.05E-01
14 HNO3  (D) 0.           2.11E-06   2.109E-06   2.94E-06 1.42E-06 1.12E-06 1.12E-06 1.42E-06 2.94E-06
15 HSO4  (D) 0.           8.37E-08   8.366E-08   9.34E-08 7.40E-08 6.89E-08 6.89E-08 7.40E-08 9.34E-08
16 ETH   (D) 1.10E-02  1.08E-02  -1.938E-04   1.08E-02 1.08E-02 1.08E-02 1.08E-02 1.08E-02 1.08E-02
17 NZA   (D) 8.70E-06  4.83E-04   4.743E-04   5.09E-04 4.68E-04 4.35E-04 4.35E-04 4.68E-04 5.09E-04
18 O     (S) 0.           5.19E-09   5.189E-09   3.95E-09 6.38E-09 7.06E-09 7.06E-09 6.38E-09 3.95E-09
19 CRIG  (S) 0.           2.49E-09   2.488E-09   3.29E-09 1.69E-09 1.32E-09 1.32E-09 1.69E-09 3.29E-09
20 MCRG  (S) 0.           1.92E-09   1.918E-09   2.63E-09 1.31E-09 1.03E-09 1.03E-09 1.31E-09 2.63E-09
21 OH    (S) 0.           1.30E-07   1.301E-07   1.59E-07 1.00E-07 9.34E-08 9.34E-08 1.00E-07 1.59E-07
22 HO2   (S) 0.           2.63E-07   2.628E-07   4.05E-07 1.07E-07 7.27E-08 7.27E-08 1.07E-07 4.05E-07
23 HRO2  (S) 0.           7.81E-08   7.806E-08   1.22E-07 2.96E-08 1.97E-08 1.97E-08 2.96E-08 1.22E-07
24 MEO2  (S) 0.           9.43E-07   9.431E-07   1.42E-06 4.26E-07 3.00E-07 3.00E-07 4.26E-07 1.42E-06
25 ACO3  (S) 0.           3.39E-07   3.391E-07   5.00E-07 1.66E-07 1.19E-07 1.19E-07 1.66E-07 5.00E-07
26 NO3   (S) 0.           1.26E-07   1.255E-07   1.73E-07 7.77E-08 5.64E-08 5.64E-08 7.77E-08 1.73E-07
27 Y     (S) 0.           1.22E-03   1.224E-03   1.68E-03 8.07E-04 3.43E-04 3.43E-04 8.07E-04 1.68E-03
28 X     (S) 0.           5.30E-09   5.295E-09   6.11E-09 4.81E-09 4.09E-09 4.09E-09 4.81E-09 6.11E-09
29 W     (S) 0.           1.40E-08   1.404E-08   1.64E-08 1.13E-08 9.72E-09 9.72E-09 1.13E-08 1.64E-08
30 HRO3  (U) 0.           1.65E-03   1.649E-03   1.35E-03 1.94E-03 2.10E-03 2.10E-03 1.94E-03 1.35E-03
31 CO2   (U) 0.           6.77E-04   6.773E-04   6.50E-04 7.10E-04 7.11E-04 7.11E-04 7.10E-04 6.50E-04
32 O2    (U) 0.           4.83E-01   4.834E-01   3.29E-01 6.22E-01 7.27E-01 7.27E-01 6.22E-01 3.29E-01
33 AERS  (U) 0.           2.05E+00   2.050E+00   1.55E+00 2.51E+00 2.83E+00 2.83E+00 2.51E+00 1.55E+00
34 AERN  (U) 0.           1.91E-04   1.912E-04   2.73E-04 1.12E-04 6.98E-05 6.98E-05 1.12E-04 2.73E-04
35 H2O   (I) 0.           1.98E+04   1.980E+04   1.98E+04 1.98E+04 1.98E+04 1.98E+04 1.98E+04 1.98E+04

                                                                      CELLS
                              ---------------------------------------------------------------------------------------------------
                                  1         2          3          4          5          6           7        8        9       10
        CELL DEPTHS (M)       1.25E+03  1.25E+03  1.25E+03   1.25E+03   1.25E+03   1.25E+03
        CELL WIDTHS (M)       1.40E+03  6.39E+02  5.26E+02   5.26E+02   6.39E+02   1.40E+03
   CELL CENTERLINES (M)      -1.87E+03 -8.46E+02 -2.63E+02   2.63E+02   8.46E+02   1.87E+03

   CELL BOUNDARIES (M)   -2.57E+03 -1.17E+03 -5.26E+02  0.         5.26E+02  1.17E+03  2.57E+03
 DIFFUSIVITIES (M2/S)    0.         5.10E+02  7.25E+02  0.         7.25E+02  5.10E+02  0.
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Figure 13 (Continued).

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 TIME= 4.00E+01 MIN.         PLUME WIDTH= 6.703E+03 M.     SIGMA Y= 1.676E+03 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 9.70E+03 METERS       PLUME DEPTH= 1.246E+03 M.                                  KI FACTOR= 4.60E-01
AERO CONC. IN MICRO-G/M**3

                                                                              CELLS
                            PLUME     PLUME-    ------------------------------------------------------------------------------------------
  SPECIES      AMBIENT      AVE.       AMB          1        2        3        4        5        6          7          8          9          10
 1 TRAC (D) 0.          1.50E-02  1.499E-02   9.15E-03 2.00E-02 2.44E-02 2.44E-02 2.00E-02 9.15E-03
 2 TEST (D) 1.00E+00 1.00E+00 -7.816E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2  (D) 1.00E-02 4.45E-02  3.485E-02   3.29E-02 5.52E-02 6.26E-02 6.26E-02 5.52E-02 3.29E-02
 4 NO   (D) 4.00E-03 1.63E-02  1.235E-02   9.02E-03 2.25E-02 2.94E-02 2.94E-02 2.25E-02 9.02E-03
 5 O3   (D) 5.91E-02 5.14E-02 -7.703E-03   5.95E-02 4.42E-02 3.06E-02 3.06E-02 4.42E-02 5.95E-02
 6 HO2  (D) 0.          7.60E-06  7.600E-06   1.16E-05 3.45E-06 2.35E-06 2.35E-06 3.45E-06 1.16E-05
 7 CO   (D) 6.00E-01 6.03E-01  3.490E-03   6.02E-01 6.04E-01 6.05E-01 6.05E-01 6.04E-01 6.02E-01
 8 FAN  (D) 6.00E-06 4.59E-04  4.530E-04   4.96E-04 4.33E-04 3.92E-04 3.92E-04 4.33E-04 4.96E-04
 9 OLE  (D) 1.10E-02 1.03E-02 -6.999E-04   1.01E-02 1.04E-02 1.06E-02 1.06E-02 1.04E-02 1.01E-02
10 CARB (D) 2.80E-02 4.54E-02  1.748E-02   4.43E-02 4.67E-02 4.70E-02 4.70E-02 4.67E-02 4.43E-02
11 PAR  (D) 3.30E-01 3.40E-01  9.667E-03   3.39E-01 3.41E-01 3.41E-01 3.41E-01 3.41E-01 3.39E-01
12 ARO  (D) 1.40E-01 1.32E-01 -7.789E-03   1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01
13 SO2  (D) 2.00E-02 1.27E-01  1.071E-01   8.53E-02 1.63E-01 1.94E-01 1.94E-01 1.63E-01 8.53E-02
14 HNO5 (D) 0.          4.11E-06  4.113E-06   5.40E-06 2.84E-06 2.24E-06 2.24E-06 2.84E-06 5.40E-06
15 HNO4 (D) 0.          1.05E-07  1.049E-07   1.10E-07 9.23E-08 8.39E-08 8.39E-08 9.23E-08 1.10E-07
16 ETH  (D) 1.10E-02 1.06E-02 -3.514E-04   1.07E-02 1.06E-02 1.06E-02 1.06E-02 1.06E-02 1.07E-02
17 HZA  (D) 8.70E-06 7.46E-04  7.861E-04   8.00E-04 7.36E-04 6.86E-04 6.86E-04 7.36E-04 8.00E-04
18 O    (S) 0.          4.86E-09  4.858E-09   3.36E-09 5.65E-09 6.40E-09 6.40E-09 5.65E-09 3.36E-09
19 CRIG (S) 0.          3.48E-09  3.482E-09   4.34E-09 2.67E-09 2.19E-09 2.19E-09 2.67E-09 4.34E-09
20 MCRG (S) 0.          2.65E-09  2.654E-09   3.30E-09 2.04E-09 1.68E-09 1.68E-09 2.04E-09 3.30E-09
21 OH   (S) 0.          1.94E-07  1.942E-07   2.33E-07 1.57E-07 1.36E-07 1.36E-07 1.57E-07 2.33E-07
22 RAO2 (S) 0.          5.44E-07  5.437E-07   8.21E-07 2.46E-07 1.67E-07 1.67E-07 2.46E-07 8.21E-07
23 HHO2 (S) 0.          1.78E-07  1.776E-07   2.73E-07 7.39E-08 4.90E-08 4.90E-08 7.39E-08 2.73E-07
24 MHO2 (S) 0.          2.21E-06  2.210E-06   3.27E-06 1.07E-06 7.53E-07 7.53E-07 1.07E-06 3.27E-06
25 ACO3 (S) 0.          7.74E-07  7.740E-07   1.11E-06 4.17E-07 3.02E-07 3.02E-07 4.17E-07 1.11E-06
26 NO3  (S) 0.          2.06E-07  2.061E-07   2.45E-07 1.77E-07 1.30E-07 1.30E-07 1.77E-07 2.45E-07
27 Y    (S) 0.          2.65E-03  2.653E-03   3.90E-03 1.23E-03 8.41E-04 8.41E-04 1.23E-03 3.90E-03
28 X    (S) 0.          7.59E-09  7.591E-09   8.64E-09 6.62E-09 5.90E-09 5.90E-09 6.62E-09 8.64E-09
29 Z    (S) 0.          1.70E-08  1.700E-08   2.08E-08 1.32E-08 1.14E-08 1.14E-08 1.32E-08 2.08E-08
30 HNO3 (U) 0.          2.87E-03  2.873E-03   2.07E-03 3.06E-03 3.34E-03 3.34E-03 3.06E-03 2.07E-03
31 CO2  (U) 0.          1.21E-03  1.212E-03   1.14E-03 1.29E-03 1.30E-03 1.30E-03 1.29E-03 1.14E-03
32 O2   (U) 0.          5.81E-01  5.803E-01   3.65E-01 7.15E-01 8.45E-01 8.45E-01 7.15E-01 3.65E-01
33 AERS (U) 0.          2.92E+00  2.922E+00   2.20E+00 3.59E+00 4.04E+00 4.04E+00 3.59E+00 2.20E+00
34 AERO (U) 0.          6.76E-04  6.758E-04   9.26E-04 4.43E-04 2.92E-04 2.92E-04 4.43E-04 9.26E-04
35 H2O  (I) 0.          1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                     CELLS
                                ---------------------------------------------------------------------------------------
                                    1         2         3         4         5         6          7         8         9        10
      CELL DEPTHS (M)           1.25E+03  1.25E+03  1.25E+03  1.25E+03  1.25E+03  1.25E+03
      CELL WIDTHS (M)           1.83E+03  8.35E+02  6.87E+02  6.87E+02  8.35E+02  1.83E+03
CELL CENTERLINES (M)           -2.44E+03 -1.10E+03 -3.44E+02  3.44E+02  1.10E+03  2.44E+03

 CELL BOUNDARIES (M)   -3.35E+03 -1.52E+03 -6.87E+02  0.         6.87E+02  1.52E+03  3.35E+03
DIFFUSIVITIES (M2/S)    0.         6.66E+02  9.47E+02  0.         9.47E+02  6.66E+02  0.
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Figure 13 (Continued).

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 TIME= 3.00E+01 MIN.            PLUME WIDTH= 8.279E+03 M.     SIGMA Y= 2.069E+03 M      WIND SPEED= 4.00E+00 M/SEC
FETCH= 1.21E+04 METERS          PLUME DEPTH= 1.247E+03 M.                                KI FACTOR= 4.04E-01
AERO CONC. IN MICRO-G/M**3


                               PLUME      PLUME-                                          CELLS
 SPECIES       AMBIENT         AVE.        AMB      ----------------------------------------------------------------------------------------
                                                        1        2        3        4        5        6        7        8        9        10
  1 TRAC  (D) 0.              1.21E-02   1.212E-02  7.40E-03 1.62E-02 1.97E-02 1.97E-02 1.62E-02 7.40E-03
  2 TEST  (D) 1.00E+00 1.00E+00 -7.816E-14  1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
  3 NO2   (D) 1.00E-02 4.02E-02  3.020E-02  2.90E-02 5.02E-02 5.79E-02 5.79E-02 5.02E-02 2.90E-02
  4 NO    (D) 4.00E-03 9.35E-03  5.353E-03  5.29E-03 1.23E-02 1.63E-02 1.63E-02 1.23E-02 5.29E-03
  5 O3    (D) 6.08E-02 6.71E-02  6.319E-03  7.36E-02 6.18E-02 5.61E-02 5.61E-02 6.18E-02 7.36E-02
  6 HO2   (D) 0.       1.50E-05  1.500E-05  2.36E-05 7.40E-06 5.09E-06 5.09E-06 7.40E-06 2.36E-05
  7 CO    (D) 6.00E-01 6.04E-01  3.924E-03  6.03E-01 6.05E-01 6.05E-01 6.05E-01 6.05E-01 6.03E-01
  8 FAR   (D) 6.00E-06 9.44E-04  9.384E-04  9.97E-04 9.18E-04 8.40E-04 8.40E-04 9.18E-04 9.97E-04
  9 OLE   (D) 1.10E-02 9.53E-03 -1.473E-03  9.44E-03 9.57E-03 9.70E-03 9.70E-03 9.57E-03 9.44E-03
 10 CARB  (D) 2.80E-02 5.41E-02  2.611E-02  5.22E-02 5.62E-02 5.67E-02 5.67E-02 5.62E-02 5.22E-02
 11 PAR   (D) 3.30E-01 3.43E-01  1.320E-02  3.42E-01 3.45E-01 3.48E-01 3.48E-01 3.45E-01 3.42E-01
 12 ARO   (D) 1.40E-01 1.28E-01 -1.200E-02  1.28E-01 1.27E-01 1.27E-01 1.27E-01 1.27E-01 1.28E-01
 13 HO2   (D) 2.00E-02 1.06E-01  8.619E-02  7.25E-02 1.33E-01 1.60E-01 1.60E-01 1.33E-01 7.25E-02
 14 HNO3  (D) 0.       7.31E-06  7.312E-06  9.80E-06 8.20E-06 4.06E-06 4.06E-06 8.20E-06 9.80E-06
 15 HNO4  (D) 0.       1.20E-07  1.190E-07  1.30E-07 1.04E-07 9.14E-08 9.14E-08 1.04E-07 1.30E-07
 16 ETH   (D) 1.10E-02 1.03E-02 -8.407E-04  1.05E-02 1.04E-02 1.04E-02 1.04E-02 1.04E-02 1.05E-02
 17 MZA   (D) 8.70E-06 1.07E-03  1.058E-03  1.13E-03 1.03E-03 9.40E-04 9.40E-04 1.03E-03 1.13E-03
 18 O     (S) 0.       3.49E-09  3.490E-09  2.66E-09 4.60E-09 5.31E-09 5.31E-09 4.60E-09 2.66E-09
 19 CRIG  (S) 0.       4.80E-09  4.800E-09  5.30E-09 3.77E-09 3.23E-09 3.23E-09 3.77E-09 5.30E-09
 20 MCRG  (S) 0.       3.30E-09  3.303E-09  3.98E-09 2.04E-09 2.46E-09 2.46E-09 2.04E-09 3.98E-09
 21 OH    (S) 0.       2.35E-07  2.354E-07  3.01E-07 1.93E-07 1.65E-07 1.65E-07 1.93E-07 3.01E-07
 22 RAO2  (S) 0.       9.65E-07  9.647E-07  1.43E-06 4.78E-07 3.38E-07 3.38E-07 4.78E-07 1.43E-06
 23 PHO2  (S) 0.       3.64E-07  3.642E-07  5.53E-07 1.60E-07 1.05E-07 1.05E-07 1.60E-07 5.53E-07
 24 MPO2  (S) 0.       4.57E-06  4.575E-06  6.70E-06 2.34E-06 1.64E-06 1.64E-06 2.34E-06 6.70E-06
 25 ACO3  (S) 0.       1.82E-06  1.816E-06  2.14E-06 8.70E-07 6.34E-07 6.34E-07 8.70E-07 2.14E-06
 26 NO3   (S) 0.       2.92E-07  2.919E-07  2.62E-07 3.45E-07 3.07E-07 3.07E-07 3.45E-07 2.62E-07
 27 Y     (S) 0.       4.92E-03  4.915E-03  7.22E-03 2.30E-03 1.72E-03 1.72E-03 2.30E-03 7.22E-03
 28 X     (S) 0.       9.52E-09  9.517E-09  1.00E-08 8.41E-09 7.81E-09 7.81E-09 8.41E-09 1.00E-08
 29 V     (S) 0.       1.61E-08  1.606E-08  2.07E-08 1.31E-08 1.11E-08 1.11E-08 1.31E-08 2.07E-08
 30 HNO3  (U) 0.       3.64E-03  3.643E-03  2.09E-03 4.36E-03 4.70E-03 4.70E-03 4.36E-03 2.09E-03
 31 CO2   (U) 0.       1.90E-03  1.902E-03  1.70E-03 2.04E-03 2.06E-03 2.06E-03 2.04E-03 1.70E-03
 32 O2    (U) 0        5.96E-01  5.964E-01  3.84E-01 7.81E-01 9.31E-01 9.31E-01 7.81E-01 3.84E-01
 33 AERS  (U) 0.       3.86E+00  3.860E+00  2.91E+00 4.74E+00 5.33E+00 5.33E+00 4.74E+00 2.91E+00
 34 AERO  (U) 0.       1.94E-03  1.938E-03  2.61E-03 1.33E-03 8.97E-04 8.97E-04 1.33E-03 2.61E-03
 35 H2O   (U) 0.       1.90E+04  1.900E+04  1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                 CELLS
                            -------------------------------------------------------------------------------------------------
                                1         2         3         4         5         6         7         8         9         10
      CELL DEPTHS (M)       1.25E+03  1.25E+03  1.25E+03  1.25E+03  1.25E+03  1.25E+03
      CELL WIDTHS (M)       2.26E+03  1.03E+03  8.40E+02  8.40E+02  1.03E+03  2.26E+03
 CELL CENTERLINES (M)      -3.01E+03 -1.36E+03 -4.24E+02  4.24E+02  1.36E+03  3.01E+03

  CELL BOUNDARIES (M)  -4.14E+03 -1.88E+03 -8.40E+02  0.        8.40E+02  1.88E+03  4.14E+03
 DIFFUSIVITIES (M2/S)   0.        8.22E+02  1.17E+03  0.        1.17E+03  8.22E+02  0.
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Figure 13 (Continued).

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 TIME= 6.00E+01 MIN.             PLUME WIDTH= 9.847E+03 M.       SIGMA Y= 2.462E+03 M.       WIND SPEED= 4.00E+00 M/SEC
FETCH= 1.43E+04 METERS           PLUME DEPTH= 1.247E+03 M.                                     KI FACTOR= 3.82E-01
AERS CONC. IN MICRO-G/M**3

                                                                                      CELLS
                                PLUME      PLUME-     ----------------------------------------------------------------------------------
  SPECIES       AMBIENT         AVE.        AMB          1         2         3         4         5         6         7         8         9        10
 1 TRAC  (D)  0.              1.02E-02   1.017E-02   6.21E-03  1.36E-02  1.65E-02  1.65E-02  1.36E-02  6.21E-03
 2 TEST  (D)  1.00E+00        1.00E+00  -7.105E-14   1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
 3 NO2   (D)  1.00E-02        3.84E-02   2.839E-02   2.82E-02  4.42E-02  5.17E-02  5.17E-02  4.42E-02  2.82E-02
 4 NO    (D)  4.00E-03        5.47E-03   1.468E-03   3.29E-03  7.18E-03  9.17E-03  9.17E-03  7.18E-03  3.29E-03
 5 O3    (D)  6.25E-02        8.14E-02   1.895E-02   8.40E-02  7.93E-02  7.80E-02  7.80E-02  7.93E-02  8.40E-02
 6 HO2   (D)  0.              2.40E-05   2.401E-05   3.41E-05  1.37E-05  9.63E-06  9.63E-06  1.37E-05  3.41E-05
 7 CO    (D)  6.00E-01        6.05E-01   4.632E-03   6.04E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.04E-01
 8 PAN   (D)  6.00E-06        1.60E-03   1.596E-03   1.61E-03  1.63E-03  1.64E-03  1.64E-03  1.63E-03  1.61E-03
 9 OLE   (D)  1.10E-02        8.83E-03  -2.167E-03   8.07E-03  8.76E-03  8.83E-03  8.83E-03  8.76E-03  8.07E-03
10 CARB  (D)  2.00E-02        5.39E-02   3.393E-02   5.04E-02  5.86E-02  6.60E-02  6.60E-02  5.86E-02  5.04E-02
11 PAR   (D)  3.30E-01        3.49E-01   1.870E-02   3.43E-01  3.48E-01  3.49E-01  3.49E-01  3.48E-01  3.43E-01
12 ARO   (D)  1.40E-01        1.24E-01  -1.620E-02   1.25E-01  1.23E-01  1.23E-01  1.23E-01  1.23E-01  1.25E-01
13 SO2   (D)  2.00E-02        9.20E-02   7.195E-02   6.30E-02  1.16E-01  1.37E-01  1.37E-01  1.16E-01  6.30E-02
14 HSO5  (D)  0.              1.01E-05   1.009E-05   1.22E-05  8.26E-06  6.64E-06  6.64E-06  8.26E-06  1.22E-05
15 HSO4  (D)  0.              1.16E-07   1.157E-07   1.28E-07  1.07E-07  9.42E-08  9.42E-08  1.07E-07  1.28E-07
16 ETH   (D)  1.10E-02        1.03E-02  -7.462E-04   1.03E-02  1.02E-02  1.02E-02  1.02E-02  1.02E-02  1.03E-02
17 BZA   (D)  8.70E-06        1.29E-03   1.277E-03   1.33E-03  1.27E-03  1.19E-03  1.19E-03  1.27E-03  1.33E-03
18 O     (S)  0.              2.83E-09   2.834E-09   2.02E-09  3.84E-09  4.14E-09  4.14E-09  3.84E-09  2.02E-09
19 CRIG  (S)  0.              5.33E-09   5.330E-09   5.97E-09  4.77E-09  4.30E-09  4.30E-09  4.77E-09  5.97E-09
20 MCRG  (S)  0.              3.95E-09   3.953E-09   4.43E-09  3.53E-09  3.19E-09  3.19E-09  3.53E-09  4.43E-09
21 OH    (S)  0.              2.27E-07   2.275E-07   2.56E-07  2.05E-07  1.70E-07  1.70E-07  2.05E-07  2.56E-07
22 HAO2  (S)  0.              1.21E-06   1.215E-06   1.69E-06  7.38E-07  5.28E-07  5.28E-07  7.38E-07  1.69E-06
23 HNO2  (S)  0.              5.45E-07   5.454E-07   7.93E-07  2.90E-07  1.97E-07  1.97E-07  2.90E-07  7.93E-07
24 MEO2  (S)  0.              7.23E-06   7.225E-06   1.01E-05  4.31E-06  3.11E-06  3.11E-06  4.31E-06  1.01E-05
25 AC03  (S)  0.              2.23E-06   2.226E-06   2.97E-06  1.50E-06  1.13E-06  1.13E-06  1.50E-06  2.97E-06
26 NO3   (S)  0.              3.72E-07   3.724E-07   2.56E-07  5.00E-07  5.27E-07  5.27E-07  5.00E-07  2.56E-07
27 Y     (S)  0.              6.53E-03   6.531E-03   9.02E-03  4.05E-03  2.92E-03  2.92E-03  4.05E-03  9.02E-03
28 X     (S)  0.              9.72E-09   9.722E-09   1.04E-08  9.30E-09  8.41E-09  8.41E-09  9.30E-09  1.04E-08
29 S     (S)  0.              1.38E-08   1.383E-08   1.64E-08  1.15E-08  9.81E-09  9.81E-09  1.15E-08  1.64E-08
30 HNO3  (U)  0.              4.87E-03   4.866E-03   3.51E-03  5.56E-03  6.16E-03  6.16E-03  5.56E-03  3.51E-03
31 CO2   (U)  0.              2.57E-03   2.573E-03   2.34E-03  2.83E-03  2.89E-03  2.89E-03  2.83E-03  2.34E-03
32 O2    (U)  0.              6.15E-01   6.153E-01   3.92E-01  8.10E-01  9.73E-01  9.73E-01  8.10E-01  3.92E-01
33 AERS  (U)  0.              4.65E+00   4.654E+00   3.45E+00  5.77E+00  6.50E+00  6.50E+00  5.77E+00  3.45E+00
34 AERO  (U)  0.              4.22E-03   4.223E-03   5.37E-03  3.25E-03  2.88E-03  2.88E-03  3.25E-03  5.37E-03
35 H2O   (I)  0.              1.90E+04   1.900E+04   1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04

                                                                      CELLS
                                 ----------------------------------------------------------------------------------
                                      1          2          3          4          5          6          7          8          9         10
        CELL DEPTHS (M)           1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
        CELL WIDTHS (M)           2.69E+03   1.23E+03   1.01E+03   1.01E+03   1.23E+03   2.69E+03
 CELL CENTERLINES (M)            -3.88E+03  -1.62E+03  -5.05E+02   5.05E+02   1.62E+03   3.88E+03

  CELL BOUNDARIES (M)   -4.92E+03 -2.24E+03 -1.01E+03  0.               1.01E+03   2.24E+03   4.92E+03
DIFFUSIVITIES (M2/S)     0.         9.79E+02  1.89E+03  0.               1.89E+03   9.79E+02   0.
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Figure 13 (Continued).

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 TIME= 7.00E+01 MIN.          PLUME WIDTH= 1.142E+04 M.      SIGMA Y= 2.855E+03 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 1.68E+04 METERS        PLUME DEPTH= 1.248E+03 M.                                 KI FACTOR= 5.00E-01
AERO CONC. IN MICRO-G/M**3

                              PLUME      PLUME-                                       CELLS
  SPECIES      AMBIENT        AVE.        AMB      ---------------------------------------------------------------------------------------------
                                                        1         2         3         4         5         6         7         8         9        10
 1 TRAC (D) 0.             8.76E-03  8.763E-03   5.35E-03 1.17E-02 1.42E-02 1.42E-02 1.17E-02 5.35E-03
 2 TEST (D) 1.00E+00 1.00E+00 -7.105E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2  (D) 1.00E-02 3.07E-02  2.072E-02   2.20E-02 3.81E-02 4.49E-02 4.49E-02 3.81E-02 2.20E-02
 4 NO   (D) 4.00E-03 3.40E-03 -6.031E-04   2.24E-03 4.31E-03 5.37E-03 5.37E-03 4.31E-03 2.24E-03
 5 O3   (D) 6.42E-02 9.16E-02  2.740E-02   9.10E-02 9.32E-02 9.14E-02 9.14E-02 9.32E-02 9.10E-02
 6 NO3  (D) 0.       3.07E-05  3.070E-05   4.04E-05 2.14E-05 1.61E-05 1.61E-05 2.14E-05 4.04E-05
 7 CO   (D) 6.00E-01 6.05E-01  5.392E-03   6.04E-01 6.06E-01 6.07E-01 6.07E-01 6.06E-01 6.04E-01
 8 FAR  (D) 6.00E-06 2.26E-03  2.257E-03   2.11E-03 2.46E-03 2.43E-03 2.43E-03 2.46E-03 2.11E-03
 9 OLE  (D) 1.10E-02 8.30E-03 -2.697E-03   8.50E-03 8.07E-03 8.06E-03 8.06E-03 8.07E-03 8.50E-03
10 CARB (D) 2.80E-02 6.74E-02  3.944E-02   6.17E-02 7.32E-02 7.56E-02 7.56E-02 7.32E-02 6.17E-02
11 PAR  (D) 3.30E-01 3.47E-01  1.660E-02   3.43E-01 3.50E-01 3.51E-01 3.51E-01 3.50E-01 3.43E-01
12 ARO  (D) 1.40E-01 1.20E-01 -1.983E-02   1.22E-01 1.18E-01 1.18E-01 1.18E-01 1.18E-01 1.22E-01
13 SO2  (D) 2.00E-02 8.16E-02  6.163E-02   5.75E-02 1.03E-01 1.21E-01 1.21E-01 1.03E-01 5.75E-02
14 HSO3 (D) 0.       1.22E-05  1.216E-05   1.32E-05 1.16E-05 9.94E-06 9.94E-06 1.16E-05 1.32E-05
15 HSO4 (D) 0.       1.04E-07  1.044E-07   1.08E-07 1.05E-07 9.49E-08 9.49E-08 1.05E-07 1.08E-07
16 ETH  (D) 1.10E-02 1.01E-02 -9.063E-04   1.02E-02 1.00E-02 9.97E-03 9.97E-03 1.00E-02 1.02E-02
17 NZA  (D) 8.70E-06 1.38E-03  1.373E-03   1.36E-03 1.43E-03 1.37E-03 1.37E-03 1.43E-03 1.36E-03
18 O    (S) 0.       2.09E-09  2.094E-09   1.50E-09 2.60E-09 3.06E-09 3.06E-09 2.60E-09 1.50E-09
19 CRIG (S) 0.       5.88E-09  5.882E-09   6.34E-09 5.49E-09 5.13E-09 5.13E-09 5.49E-09 6.34E-09
20 MCRG (S) 0.       4.31E-09  4.311E-09   4.67E-09 4.00E-09 3.74E-09 3.74E-09 4.00E-09 4.67E-09
21 OH   (S) 0.       2.01E-07  2.005E-07   2.10E-07 1.97E-07 1.78E-07 1.78E-07 1.97E-07 2.10E-07
22 RAO2 (S) 0.       1.29E-06  1.292E-06   1.66E-06 9.47E-07 7.26E-07 7.26E-07 9.47E-07 1.66E-06
23 PRO2 (S) 0.       6.91E-07  6.905E-07   9.37E-07 4.51E-07 3.27E-07 3.27E-07 4.51E-07 9.37E-07
24 MEO2 (S) 0.       9.45E-06  9.454E-06   1.23E-05 6.73E-06 5.15E-06 5.15E-06 6.73E-06 1.23E-05
25 ACO3 (S) 0.       2.81E-06  2.807E-06   3.44E-06 2.22E-06 1.70E-06 1.70E-06 2.22E-06 3.44E-06
26 NO3  (S) 0.       4.17E-07  4.166E-07   2.54E-07 5.60E-07 6.75E-07 6.75E-07 5.60E-07 2.54E-07
27 Y    (S) 0.       7.23E-03  7.228E-03   9.23E-03 5.30E-03 4.15E-03 4.15E-03 5.30E-03 9.23E-03
28 X    (S) 0.       8.92E-09  8.917E-09   8.87E-09 9.23E-09 8.67E-09 8.67E-09 9.23E-09 8.87E-09
29 W    (S) 0.       1.09E-08  1.092E-08   1.25E-08 9.57E-09 8.33E-09 8.33E-09 9.57E-09 1.25E-08
30 HNO3 (U) 0.       5.19E-03  5.189E-03   3.82E-03 6.46E-03 7.30E-03 7.30E-03 6.46E-03 3.82E-03
31 CO2  (U) 0.       3.11E-03  3.106E-03   2.70E-03 3.53E-03 3.69E-03 3.69E-03 3.53E-03 2.70E-03
32 O2   (U) 0.       6.14E-01  6.143E-01   3.88E-01 8.11E-01 9.79E-01 9.79E-01 8.11E-01 3.88E-01
33 AERS (U) 0.       5.19E+00  5.194E+00   3.72E+00 6.54E+00 7.47E+00 7.47E+00 6.54E+00 3.72E+00
34 AERO (U) 0.       7.18E-03  7.177E-03   8.44E-03 6.25E-03 4.94E-03 4.94E-03 6.25E-03 8.44E-03
35 H2O  (I) 0.       1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                   CELLS
                           ----------------------------------------------------------------------------------------------------------
                                 1          2          3          4          5          6          7          8          9         10
        CELL DEPTHS (M)      1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
        CELL WIDTHS (M)      3.12E+03   1.42E+03   1.17E+03   1.17E+03   1.42E+03   3.12E+03
   CELL CENTERLINES (M)     -4.15E+03  -1.88E+03  -5.85E+02   5.85E+02   1.88E+03   4.15E+03

   CELL BOUNDARIES (M)  -5.71E+03 -2.59E+03 -1.17E+03  0.         1.17E+03  2.59E+03  5.71E+03
 DIFFUSIVITIES (M2/S)    0.         1.13E+03  1.61E+03  0.         1.61E+03  1.13E+03  0.
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Figure 13 (Continued).

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 TIME= 8.00E+01 MIN          PLUME WIDTH= 1.299E+04 M.      SIGMA Y= 3.248E+03 M       WIND SPEED= 4.00E+00 M/SEC
 FETCH= 1.93E+04 METERS      PLUME DEPTH= 1.240E+03 M.                                   KI FACTOR= 2.74E-01
 AERO CONC. IN MICRO-G/M**3


                                                                                   CELLS
                                PLUME      PLUME-     --------------------------------------------------------------------------------------
    SPECIES      AMBIENT        AVE.        AMB          1         2         3         4         5         6          7         8         9         10
  1 TRAC  (D) 0.          7.70E-03  7.703E-03   4.70E-03  1.03E-02  1.25E-02  1.25E-02  1.03E-02  4.70E-03
  2 TEST  (D) 1.00E+00  1.00E+00 -7.816E-14   1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
  3 NO2   (D) 1.00E-02  2.64E-02  1.643E-02   1.94E-02  3.24E-02  3.80E-02  3.80E-02  3.24E-02  1.94E-02
  4 NO    (D) 4.00E-03  2.38E-03 -1.618E-03   1.71E-03  2.92E-03  3.61E-03  3.61E-03  2.92E-03  1.71E-03
  5 O3    (D) 6.46E-02  9.64E-02  3.176E-02   9.42E-02  1.03E-01  1.04E-01  1.04E-01  1.03E-01  9.42E-02
  6 HO2   (D) 0.          3.63E-05  3.631E-05   4.45E-05  2.09E-05  2.35E-05  2.35E-05  2.09E-05  4.45E-05
  7 CO    (D) 6.00E-01  6.06E-01  6.119E-03   6.05E-01  6.07E-01  6.08E-01  6.08E-01  6.07E-01  6.05E-01
  8 PAN   (D) 6.00E-06  2.86E-03  2.856E-03   2.49E-03  3.26E-03  3.37E-03  3.37E-03  3.26E-03  2.49E-03
  9 OLE   (D) 1.18E-02  7.91E-03 -3.890E-03   8.36E-03  7.84E-03  7.42E-03  7.42E-03  7.84E-03  8.36E-03
 10 CARB  (D) 2.80E-02  7.10E-02  4.303E-02   6.33E-02  7.85E-02  8.25E-02  8.25E-02  7.85E-02  6.33E-02
 11 PAR   (D) 3.30E-01  3.46E-01  1.622E-02   3.42E-01  3.50E-01  3.52E-01  3.52E-01  3.50E-01  3.42E-01
 12 ARO   (D) 1.40E-01  1.18E-01 -2.194E-02   1.21E-01  1.16E-01  1.14E-01  1.14E-01  1.16E-01  1.21E-01
 13 SO2   (D) 2.00E-02  7.39E-02  5.391E-02   5.28E-02  9.22E-02  1.00E-01  1.00E-01  9.22E-02  5.28E-02
 14 HSO3  (D) 0.          1.37E-05  1.370E-05   1.36E-05  1.43E-05  1.32E-05  1.32E-05  1.43E-05  1.36E-05
 15 HNO4  (D) 0.          9.82E-08  9.822E-08   9.61E-08  1.03E-07  9.79E-08  9.79E-08  1.03E-07  9.61E-08
 16 ETH   (D) 1.10E-02  9.97E-03 -1.032E-03   1.01E-02  9.83E-03  9.77E-03  9.77E-03  9.83E-03  1.01E-02
 17 BZA   (D) 8.70E-06  1.40E-03  1.394E-03   1.33E-03  1.50E-03  1.48E-03  1.48E-03  1.50E-03  1.33E-03
 18 O     (S) 0.          1.65E-09  1.646E-09   1.21E-09  2.02E-09  2.37E-09  2.37E-09  2.02E-09  1.21E-09
 19 CRIG  (S) 0.          6.22E-09  6.218E-09   6.84E-09  5.95E-09  5.69E-09  5.69E-09  5.95E-09  6.84E-09
 20 MCRG  (S) 0.          4.51E-09  4.513E-09   4.70E-09  4.28E-09  4.08E-09  4.08E-09  4.28E-09  4.70E-09
 21 OH    (S) 0.          1.80E-07  1.795E-07   1.80E-07  1.83E-07  1.74E-07  1.74E-07  1.83E-07  1.80E-07
 22 RAO2  (S) 0.          1.30E-06  1.290E-06   1.58E-06  1.04E-06  8.59E-07  8.59E-07  1.04E-06  1.58E-06
 23 HHO2  (S) 0.          8.13E-07  8.123E-07   1.03E-06  6.06E-07  4.76E-07  4.76E-07  6.06E-07  1.03E-06
 24 MEO2  (S) 0.          1.15E-05  1.152E-05   1.40E-05  9.31E-06  7.66E-06  7.66E-06  9.31E-06  1.40E-05
 25 ACO3  (S) 0.          3.41E-06  3.408E-06   3.91E-06  3.00E-06  2.80E-06  2.80E-06  3.00E-06  3.91E-06
 26 NO3   (S) 0.          4.10E-07  4.102E-07   2.44E-07  5.43E-07  6.91E-07  6.91E-07  5.43E-07  2.44E-07
 27 Y     (S) 0.          7.56E-03  7.556E-03   9.07E-03  6.22E-03  5.15E-03  5.15E-03  6.22E-03  9.07E-03
 28 X     (S) 0.          8.27E-09  8.266E-09   7.79E-09  8.89E-09  8.77E-09  8.77E-09  8.89E-09  7.79E-09
 29 W     (S) 0.          9.10E-09  9.099E-09   1.03E-08  8.85E-09  7.20E-09  7.20E-09  8.85E-09  1.03E-08
 30 HNO3  (U) 0.          5.84E-03  5.844E-03   3.93E-03  7.01E-03  8.07E-03  8.07E-03  7.01E-03  3.93E-03
 31 CO2   (U) 0.          3.51E-03  3.505E-03   2.92E-03  4.08E-03  4.37E-03  4.37E-03  4.08E-03  2.92E-03
 32 O2    (U) 0.          6.02E-01  6.021E-01   3.79E-01  7.96E-01  9.61E-01  9.61E-01  7.96E-01  3.79E-01
 33 AERS  (U) 0.          5.52E+00  5.518E+00   3.83E+00  7.04E+00  8.16E+00  8.16E+00  7.04E+00  3.83E+00
 34 AERO  (U) 0.          1.04E-02  1.037E-02   1.12E-02  9.92E-03  8.65E-03  8.65E-03  9.92E-03  1.12E-02
 35 H2O   (I) 0.          1.90E+04  1.900E+04   1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04

                                                                           CELLS
                           ----------------------------------------------------------------------------------------------------
                               1          2          3          4          5          6          7          8          9         10
     CELL DEPTHS (M)       1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
     CELL WIDTHS (M)       3.55E+03   1.62E+03   1.33E+03   1.33E+03   1.62E+03   3.55E+03
 CELL CENTERLINES (M)     -4.72E+03  -2.14E+03  -6.66E+02   6.66E+02   2.14E+03   4.72E+03

  CELL BOUNDARIES (M)  -6.50E+03 -2.95E+03 -1.33E+03  0.          1.33E+03  2.95E+03  6.50E+03
 DIFFUSIVITIES (M2/S)  0.         1.29E+03  1.84E+03  0.          1.84E+03  1.29E+03  0.
```

Figure 13 (Continued).

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 TIME= 9.00E+01 MIN.          PLUME WIDTH= 1.456E+04 M.     SIGMA Y= 3.661E+03 M.     WIND SPEED= 4.00E+00 M/SEC
 FETCH= 2.17E+04 METERS       PLUME DEPTH= 1.249E+03 M.                                 KI FACTOR= 2.40E-01
 AERO CONC. IN MICRO-G/M**3

                                                                              CELLS
                           PLUME     PLUME-   ------------------------------------------------------------------------------------------
  SPECIES      AMBIENT     AVE.       AMB        1        2        3        4        5        6        7        8        9       10
  1 TRAC (D) 0.          6.89E-03  6.893E-03  4.21E-03 9.22E-03 1.12E-02 1.12E-02 9.22E-03 4.21E-03
  2 TEST (D) 1.00E+00 1.00E+00 -7.816E-14  1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
  3 NO2  (D) 1.00E-02 2.30E-02  1.297E-02  1.74E-02 2.76E-02 3.21E-02 3.21E-02 2.76E-02 1.74E-02
  4 NO   (D) 4.00E-03 1.76E-03 -2.240E-03  1.37E-03 2.00E-03 2.42E-03 2.42E-03 2.00E-03 1.37E-03
  5 O3   (D) 6.93E-02 1.02E-01  3.308E-02  9.58E-02 1.09E-01 1.12E-01 1.12E-01 1.09E-01 9.58E-02
  6 HO2  (D) 0.          4.02E-05  4.015E-05  4.59E-05 3.54E-05 3.06E-05 3.06E-05 3.54E-05 4.59E-05
  7 CO   (D) 6.00E-01 6.07E-01  6.770E-03  6.05E-01 6.08E-01 6.09E-01 6.09E-01 6.08E-01 6.05E-01
  8 FOR  (D) 6.00E-06 3.36E-03  3.356E-03  2.76E-03 3.95E-03 4.24E-03 4.24E-03 3.95E-03 2.76E-03
  9 OLE  (D) 1.10E-02 7.62E-03 -3.377E-03  8.10E-03 7.15E-03 6.92E-03 6.92E-03 7.15E-03 8.10E-03
 10 CARB (D) 2.80E-02 7.32E-02  4.518E-02  6.39E-02 8.19E-02 8.73E-02 8.73E-02 8.19E-02 6.39E-02
 11 PAR  (D) 3.30E-01 3.45E-01  1.514E-02  3.41E-01 3.49E-01 3.51E-01 3.51E-01 3.49E-01 3.41E-01
 12 ARO  (D) 1.40E-01 1.16E-01 -2.360E-02  1.20E-01 1.13E-01 1.11E-01 1.11E-01 1.13E-01 1.20E-01
 13 SO2  (D) 2.00E-02 6.80E-02  4.803E-02  4.92E-02 8.43E-02 9.83E-02 9.83E-02 8.43E-02 4.92E-02
 14 HSO3 (D) 0.          1.46E-05  1.462E-05  1.34E-05 1.63E-05 1.60E-05 1.60E-05 1.63E-05 1.34E-05
 15 HSO4 (D) 0.          9.00E-08  8.996E-08  8.40E-08 9.70E-08 9.63E-08 9.63E-08 9.70E-08 8.40E-08
 16 ETH  (D) 1.10E-02 9.87E-03 -1.128E-03  1.01E-02 9.70E-03 9.60E-03 9.60E-03 9.70E-03 1.01E-02
 17 BZA  (D) 8.70E-06 1.38E-03  1.373E-03  1.28E-03 1.50E-03 1.52E-03 1.52E-03 1.50E-03 1.28E-03
 18 O    (R) 0.          1.29E-09  1.293E-09  9.79E-10 1.56E-09 1.81E-09 1.81E-09 1.56E-09 9.79E-10
 19 CRIC (R) 0.          6.41E-09  6.405E-09  6.64E-09 6.21E-09 6.02E-09 6.02E-09 6.21E-09 6.64E-09
 20 MCRC (R) 0.          4.61E-09  4.612E-09  4.84E-09 4.41E-09 4.25E-09 4.25E-09 4.41E-09 4.84E-09
 21 OH   (R) 0.          1.55E-07  1.546E-07  1.50E-07 1.62E-07 1.58E-07 1.58E-07 1.62E-07 1.50E-07
 22 RAO2 (R) 0.          1.23E-06  1.229E-06  1.44E-06 1.04E-06 8.97E-07 8.97E-07 1.04E-06 1.44E-06
 23 HNO2 (S) 0.          9.00E-07  8.995E-07  1.08E-06 7.44E-07 6.19E-07 6.19E-07 7.44E-07 1.08E-06
 24 MEO2 (S) 0.          1.31E-05  1.314E-05  1.49E-05 1.17E-05 1.02E-05 1.02E-05 1.17E-05 1.49E-05
 25 ACO3 (R) 0.          3.93E-06  3.926E-06  4.20E-06 3.75E-06 3.41E-06 3.41E-06 3.75E-06 4.20E-06
 26 NO3  (S) 0.          3.96E-07  3.961E-07  2.43E-07 5.13E-07 6.62E-07 6.62E-07 5.13E-07 2.43E-07
 27 Y    (S) 0.          7.41E-03  7.412E-03  8.40E-03 6.62E-03 5.65E-03 5.65E-03 6.62E-03 8.40E-03
 28 X    (S) 0.          7.35E-09  7.351E-09  6.67E-09 8.10E-09 8.24E-09 8.24E-09 8.10E-09 6.67E-09
 29 W    (S) 0.          7.52E-09  7.523E-09  8.47E-09 6.60E-09 6.03E-09 6.03E-09 6.60E-09 8.47E-09
 30 HNO3 (U) 0.          5.72E-03  5.721E-03  3.94E-03 7.31E-03 8.52E-03 8.52E-03 7.31E-03 3.94E-03
 31 CO2  (U) 0.          3.82E-03  3.818E-03  3.07E-03 4.53E-03 4.94E-03 4.94E-03 4.53E-03 3.07E-03
 32 O2   (U) 0.          5.85E-01  5.852E-01  3.69E-01 7.73E-01 9.33E-01 9.33E-01 7.73E-01 3.69E-01
 33 AERS (U) 0.          5.71E+00  5.705E+00  3.87E+00 7.34E+00 8.61E+00 8.61E+00 7.34E+00 3.87E+00
 34 AERO (U) 0.          1.36E-02  1.359E-02  1.37E-02 1.39E-02 1.30E-02 1.30E-02 1.39E-02 1.37E-02
 35 H2O  (U) 0.          1.90E+04  1.900E+04  1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                 CELLS
                             ---------------------------------------------------------------------------------------
                                1          2          3          4          5          6          7        8        9       10
         CELL DEPTHS (M)     1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
         CELL WIDTHS (M)     3.97E+03   1.81E+03   1.49E+03   1.49E+03   1.81E+03   3.97E+03
   CELL CENTERLINES (M)     -5.29E+03  -2.40E+03  -7.46E+02   7.46E+02   2.40E+03   5.29E+03

    CELL BOUNDARIES (M)  -7.28E+03 -3.31E+03 -1.49E+03  0.          1.49E+03  3.31E+03  7.28E+03
  DIFFUSIVITIES (M2/S)   0.          1.45E+03  2.06E+03  0.          2.06E+03  1.45E+03  0.
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Figure 13 (Continued).

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 TIME= 1.00E+02 MIN.        PLUME WIDTH= 1.614E+04 M.     SIGMA Y= 4.034E+03 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 2.41E+04 METERS      PLUME DEPTH= 1.249E+03 M.                                 KI FACTOR= 2.22E-01
AERS CONC. IN MICRO-G/M**3

                                                                                 CELLS
                              PLUME     PLUME-   ----------------------------------------------------------------------------------
 SPECIES       AMBIENT        AVE.       AMB         1        2        3        4        5        6        7        8        9       10
 1 TRAC (D) 0.           6.24E-03  6.239E-03   5.81E-03 8.34E-03 1.01E-02 1.01E-02 8.34E-03 5.81E-03
 2 TEST (D) 1.00E+00  1.00E+00 -8.827E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2  (D) 1.00E-02  2.02E-02  1.016E-02   1.58E-02 2.38E-02 2.73E-02 2.73E-02 2.38E-02 1.58E-02
 4 NO   (D) 4.00E-03  1.34E-03 -2.656E-03   1.11E-03 1.53E-03 1.73E-03 1.73E-03 1.53E-03 1.11E-03
 5 O3   (D) 7.21E-02  1.04E-01  3.230E-02   9.63E-02 1.12E-01 1.17E-01 1.17E-01 1.12E-01 9.63E-02
 6 HO2  (D) 0.        4.24E-05  4.240E-05   4.59E-05 3.90E-05 3.62E-05 3.62E-05 3.90E-05 4.59E-05
 7 CO   (D) 6.00E-01  6.07E-01  7.300E-03   6.05E-01 6.09E-01 6.10E-01 6.10E-01 6.09E-01 6.05E-01
 8 PAN  (D) 6.00E-06  3.74E-03  3.734E-03   2.93E-03 4.53E-03 4.96E-03 4.96E-03 4.50E-03 2.93E-03
 9 OLE  (D) 1.10E-02  7.42E-03 -3.580E-03   8.00E-03 6.86E-03 6.35E-03 6.35E-03 6.86E-03 8.00E-03
10 CARB (D) 2.80E-02  7.42E-02  4.620E-02   6.38E-02 8.38E-02 9.01E-02 9.01E-02 8.38E-02 6.38E-02
11 PAR  (D) 3.30E-01  3.44E-01  1.374E-02   3.40E-01 3.47E-01 3.50E-01 3.50E-01 3.47E-01 3.40E-01
12 ARO  (D) 1.40E-01  1.15E-01 -2.482E-02   1.20E-01 1.11E-01 1.08E-01 1.08E-01 1.11E-01 1.20E-01
13 SO2  (D) 2.00E-02  6.33E-02  4.330E-02   4.63E-02 7.00E-02 9.06E-02 9.06E-02 7.00E-02 4.63E-02
14 HSO3 (D) 0.        1.49E-05  1.493E-05   1.20E-05 1.74E-05 1.79E-05 1.79E-05 1.74E-05 1.20E-05
15 HSO4 (D) 0.        8.00E-08  8.003E-08   7.19E-08 8.92E-08 9.06E-08 9.06E-08 8.92E-08 7.19E-08
16 ETH  (D) 1.10E-02  9.80E-03 -1.197E-03   1.00E-02 9.60E-03 9.47E-03 9.47E-03 9.60E-03 1.00E-02
17 BZA  (D) 8.70E-06  1.33E-03  1.322E-03   1.21E-03 1.46E-03 1.50E-03 1.50E-03 1.46E-03 1.21E-03
18 O    (S) 0.        1.02E-09  1.016E-09   7.97E-10 1.20E-09 1.30E-09 1.30E-09 1.20E-09 7.97E-10
19 CRIG (S) 0.        6.50E-09  6.499E-09   6.69E-09 6.34E-09 6.10E-09 6.10E-09 6.34E-09 6.69E-09
20 MCRG (S) 0.        4.65E-09  4.651E-09   4.87E-09 4.46E-09 4.31E-09 4.31E-09 4.46E-09 4.87E-09
21 OH   (S) 0.        1.30E-07  1.302E-07   1.24E-07 1.37E-07 1.37E-07 1.37E-07 1.37E-07 1.24E-07
22 RAO2 (S) 0.        1.12E-06  1.117E-06   1.28E-06 9.73E-07 8.59E-07 8.59E-07 9.73E-07 1.28E-06
23 HNO2 (S) 0.        9.50E-07  9.490E-07   1.08E-06 8.41E-07 7.37E-07 7.37E-07 8.41E-07 1.08E-06
24 MEO2 (S) 0.        1.42E-05  1.425E-05   1.52E-05 1.36E-05 1.24E-05 1.24E-05 1.36E-05 1.52E-05
25 ACO3 (S) 0.        4.35E-06  4.347E-06   4.37E-06 4.41E-06 4.20E-06 4.20E-06 4.41E-06 4.37E-06
26 NO3  (S) 0.        3.07E-07  3.074E-07   2.49E-07 4.92E-07 6.29E-07 6.29E-07 4.92E-07 2.49E-07
27 Y    (S) 0.        6.92E-03  6.921E-03   7.67E-03 6.31E-03 5.66E-03 5.66E-03 6.31E-03 7.67E-03
28 X    (S) 0.        6.34E-09  6.342E-09   5.64E-09 7.06E-09 7.35E-09 7.35E-09 7.06E-09 5.64E-09
29 Z    (S) 0.        6.10E-09  6.102E-09   6.98E-09 5.43E-09 4.96E-09 4.96E-09 5.43E-09 6.98E-09
30 HNO3 (U) 0.        5.78E-03  5.783E-03   3.09E-03 7.40E-03 8.70E-03 8.70E-03 7.40E-03 3.09E-03
31 CO2  (U) 0.        4.04E-03  4.039E-03   3.16E-03 4.05E-03 5.30E-03 5.30E-03 4.05E-03 3.16E-03
32 O2   (U) 0.        5.66E-01  5.656E-01   3.58E-01 7.46E-01 8.99E-01 8.99E-01 7.46E-01 3.58E-01
33 AERS (U) 0.        5.77E+00  5.772E+00   3.04E+00 7.40E+00 8.83E+00 8.83E+00 7.40E+00 3.04E+00
34 AERO (U) 0.        1.68E-02  1.683E-02   1.57E-02 1.76E-02 1.73E-02 1.73E-02 1.76E-02 1.57E-02
35 H2O  (I) 0.        1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                     CELLS
                              ---------------------------------------------------------------------------------------------
                                   1          2          3          4          5          6         7        8        9       10
       CELL DEPTHS (M)         1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03   1.25E+03
       CELL WIDTHS (M)         4.40E+03   2.01E+03   1.65E+03   1.65E+03   2.01E+03   4.40E+03
  CELL CENTERLINES (M)        -5.87E+03  -2.66E+03  -8.27E+02   8.27E+02   2.66E+03   5.87E+03

   CELL BOUNDARIES (M)  -8.07E+03 -3.66E+03 -1.65E+03  0.          1.65E+03  3.66E+03  8.07E+03
DIFFUSIVITIES (M2/S)    0.          1.60E+03  3.20E+03  0.          3.20E+03  1.60E+03  0.
```

Figure 13 (Continued).

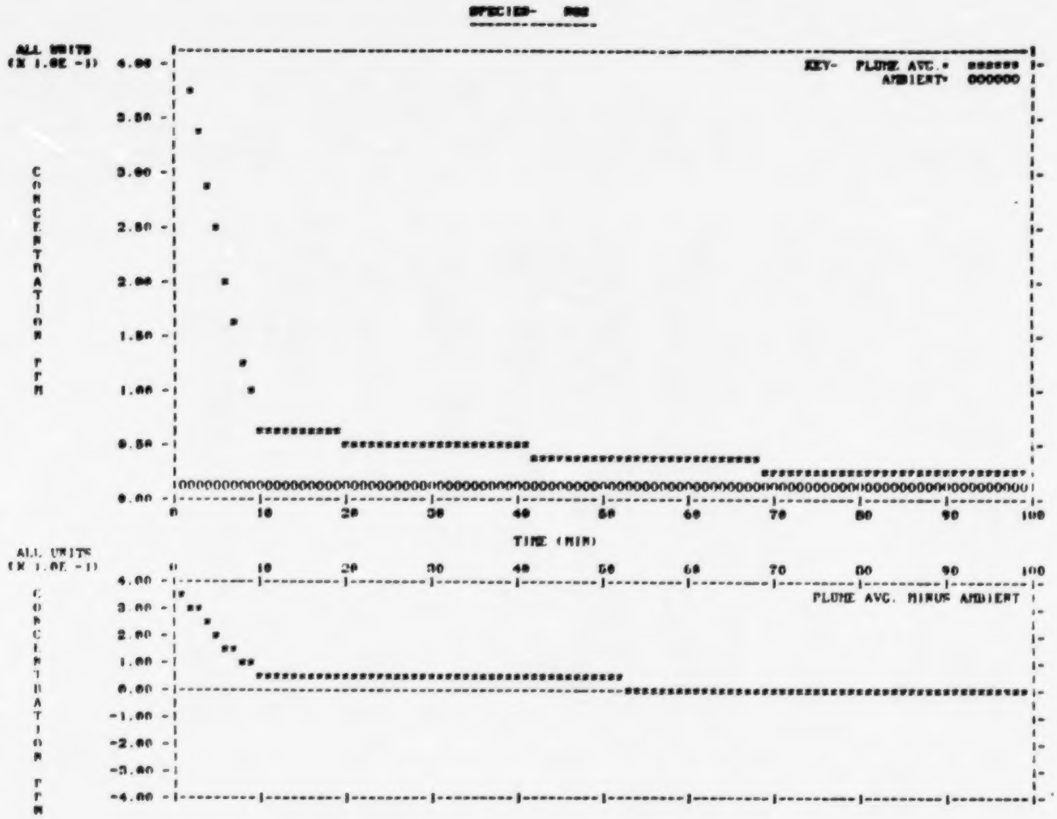


Figure 13 (Continued).

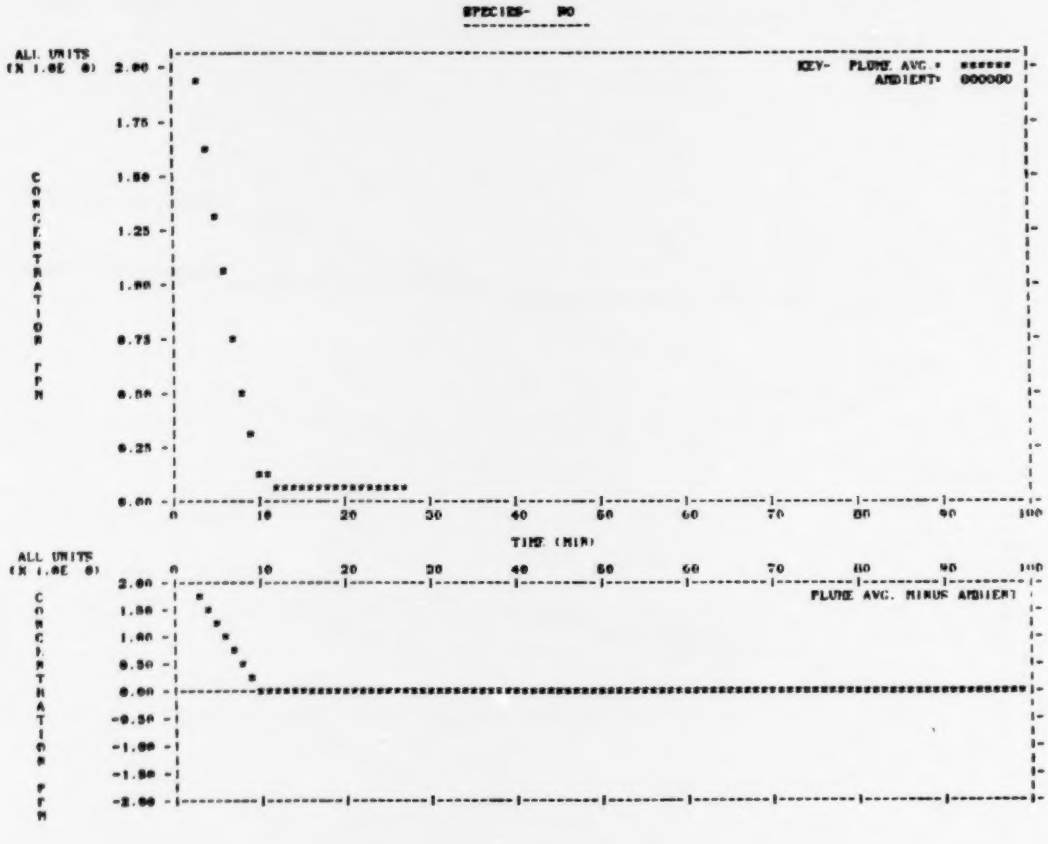


Figure 13 (Continued).

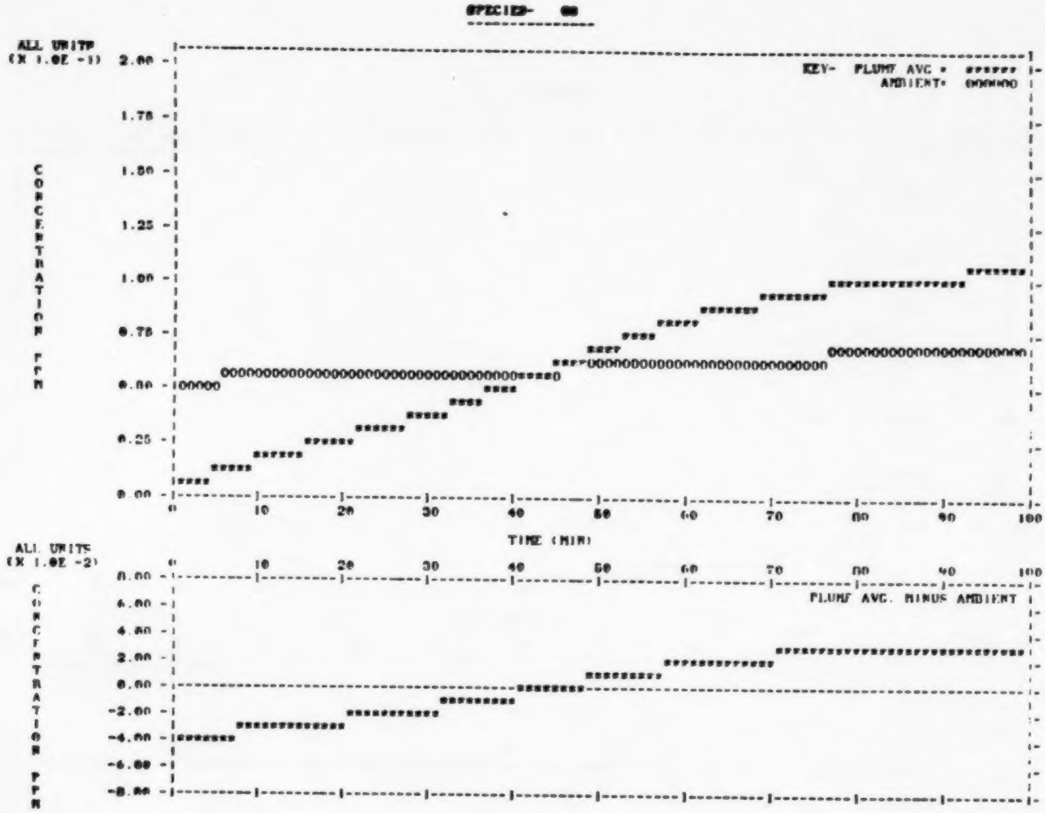


Figure 13 (Concluded).

```
RPM-II ... TEST DATA NO. 2

SIMULATION MODES-              MODE1= 1
                               MODE2= 1
                               MODE3= 3

        WHERE...   MODE1= 1 -SINGLE PLUME SIMULATION
                          2 -MULTIPLE PLUME SIMULATION

                   MODE2= 1 -AMBIENT SIMULATION ONLY (EG. SMOG CHAMBER)
                          2 -PLUME SIMULATION ONLY (AMBIENT CONCENTRATIONS MUST BE INPUT)
                          3 -AMBIENT SIMULATION FOLLOWED BY PLUME RUN

                   MODE3= 1 -NEAR SOURCE SIMULATION (ELLIPTICAL CROSS SECTIONS)
                          2 -NEAR SOURCE MERGING TO FAR SOURCE
                          3 -FAR SOURCE SIMULATION (VERTICALLY UNIFORM CONCEN  TRATIONS ASSUMED)

        -NOTE-   1) MODE1=2 CAN ONLY OPERATE WITH MODE3=3
                 2) MODE1=2 NOT AVAILABLE AT THIS TIME
                 3) MODE3=1+2 ALSO NOT YET AVAILABLE

OUTPUT IS NOT TO BE SAVED ON DISK

PRINTED OUTPUT INTERVAL IS  1.000E+01 MIN.

MODEL SIMULATION BEGINS AT  1.000E+02 METERS AND ENDS AT  1.000E+02 MIN. OR  3.500E+04 METERS, WHICH EVER OCCURS FIRST
                            0.         MIN.

PLUME PARAMETERS    1) NO. OF CELLS (RECTANGULAR APPROXIMATION)= 6
                    2) NO. OF CELLS (ELLIPTICAL APPROXIMATION)=  NOT APPLICABLE
                    3) TOTAL PLUME WIDTH (HEIGHT) IN MULTIPLES OF SIGMA-Y (SIGMA-Z)= 4.00
                    4) LENGTH SCALE FOR DIFFUSION ACROSS PLUME BOUNDARY=  1.0 X WIDTH OF OUTER CELL

NUMERICAL CONTROLS  1) STARTING TIME STEP= 1.000E-16
                    2) MINIMUM TIME STEP=  1.000E-16
                    3) MAXIMUM TIME STEP=  1.000E+01
                    4) TOLERANCE (STEADY-STATE CALCULATION)=  5.000E-03
                    5) RELATIVE ERROR BOUND (ODE SOLVER)    =  5.000E-03

HALF OPTION (FOR SYMMETRIC PLUME) -  F

NOTE- SULFATE AEROSOL (AERS) CONCENTRATIONS ARE EXPRESSED IN MICRO-GRAMS PER METER CUBED
```

Figure 14.   Sample Output No. 2.

```
CHEMISTRY INPUT_..... CARBON BOND MECHANISM UPDATED 1978

NUMBER OF REACTIONS                         -  68
NUMBER OF DIFFERENTIAL SPECIES (D)          -  17
NUMBER OF STEADY-STATE SPECIES (S)          -  12
NUMBER OF UNCOUPLED SPECIES (U)             -   5
NUMBER OF INERT OR CONSTANT SPECIES (I)-       1
NUMBER OF ENTRAINED SPECIES                 -  13

 SPECIES  SPECIES  SPECIES        SPECIES  SPECIES  SPECIES         SPECIES  SPECIES  SPECIES         SPECIES  SPECIES  SPECIES
   NO.     NAME     TYPE            NO.     NAME     TYPE             NO.     NAME     TYPE             NO.     NAME     TYPE

    1      TRAC      D               2      TEST      D                3      NO2       D                4      NO        D
    5      O3        D               6      HO2       D                7      CO        D                8      PAN       D
    9      OLE       D              10      CARB      D               11      PAR       D               12      ARO       D
   13      SO2       D              14      HNO3      D               15      HSO4      D               16      ETH       D
   17      NZA       D              18      O         S               19      CRIC      S               20      MCRC      S
   21      OH        S              22      RAO2      S               23      RBO2      S               24      MEO2      S
   25      ACO3      S              26      NO3       S               27      Y         S               28      X         S
   29      W         S              30      HNO3      U               31      CO2       U               32      O2        U
   33      AERS      U              34      AERO      U               35      H2O       I

                                     CHEMICAL REACTIONS

                       RATE CONST.          REACTANTS          PRODUCTS

                   1  1.000E+00                   NO2 =  1.00 NO     1.00 O
                   2  4.400E+06                   O   =  1.00 O3
                   3  2.390E+01              NO   O3  =  1.00 NO2    1.00 O2
                   4  4.800E-02              NO2  O3  =  1.00 NO3    1.00 O2
                   5  1.340E+04              NO2  O   =  1.00 NO     1.00 O2
                   6  7.700E+01              OH   O3  =  1.00 HO2    1.00 O2
                   7  5.000E+00              HO2  O3  =  1.00 OH     2.00 O2
                   8  1.400E+04              OH   NO2 =  1.00 HNO3
                   9  4.400E+02              OH   CO  =  1.00 HO2    1.00 CO2
                  10  1.500E-04              NO   NO  =  2.00 NO2
                  11  2.800E+04              NO   NO3 =  2.00 NO2
                  12  3.100E-05        H2O   NO2  NO3 =  2.00 HNO3
                  13  1.200E+04              NO   HO2 =  1.00 NO2    1.00 OH
                  14  1.500E-04              HO2  HO2 =  0.00
                  15  2.000E+01              O    PAR =  1.00 MEO2   1.00 OH
                  16  1.500E+03              OH   PAR =  1.00 MEO2
                  17  2.700E+03              O    OLE =  1.00 MEO2   1.00 ACO3   1.00 X
                  18  2.700E+03              O    OLE =  1.00 CARB   1.00 PAR
                  19  4.200E+04              OH   OLE =  1.00 RAO2
                  20  8.000E-03              O3   OLE =  1.00 CARB   1.00 CRIC
                  21  8.000E-03              O3   OLE =  1.00 CARB   1.00 MCRC   1.00 X
                  22  6.000E+02              O    ETH =  1.00 MEO2   1.00 HO2    1.00 CO
                  23  6.000E+02              O    ETH =  1.00 CARB   1.00 PAR
                  24  1.200E+04              OH   ETH =  1.00 RBO2
                  25  2.400E-03              O3   ETH =  1.00 CARB   1.00 CRIC
                  26  3.800E+03              NO   ACO3=  1.00 NO2    1.00 MEO2   1.00 CO2
                  27  1.200E+04              NO   RBO2=  1.00 NO2    2.00 CARB   1.00 HO2
                  28  1.200E+04              NO   RAO2=  1.00 NO2    2.00 CARB   1.00 HO2
                  29  4.000E+03              NO   MEO2=  1.00 NO2    1.00 CARB   1.00 MEO2   1.00 X
                  30  8.000E+03              NO   MEO2=  1.00 NO2    1.00 CARB   1.00 HO2
                  31  5.000E+02              NO   MEO2=  0.00
                  32  5.000E+00              O3   RBO2=  2.00 CARB   1.00 HO2
                  33  2.000E+02              O3   RAO2=  2.00 CARB   1.00 HO2
                  34  5.000E+00              O3   MEO2=  1.00 CARB   1.00 HO2
                  35  1.900E+04              OH   CARB=   .50 HO2     .50 CO      .50 ACO3    .50 X
                  36  1.350E-03                   CARB=  1.00 CO
                  37  2.025E-03                   CARB=  1.50 HO2     .50 MEO2    .50 X      1.00 CO
                  38  1.000E+05              PAR  X   =  0.00
```

Figure 14 (Continued).

```
39  2.000E+03        NO2  ACO3=   1.00 PAN
40  2.000E-02             PAN  =   1.00 NO2    1.00 ACO3
41  4.000E+03        HO2  ACO3=   0.00
42  4.000E+03        HO2  MEO2=   0.00
43  1.200E+04        NO   CRIG=   1.00 NO2    1.00 CARB
44  8.000E+03        NO2  CRIG=   1.00 NO3    1.00 CARB
45  2.000E+03        CARB CRIG=   0.00
46  1.200E+04        NO   MCRG=   1.00 NO2    1.00 CARB
47  8.000E+03        NO2  MCRG=   1.00 NO3    1.00 CARB
48  2.000E+03        CARB MCRG=   0.00
49  6.700E+02             CRIG=   1.00 CO
50  3.400E+02             CRIG=   0.00
51  9.000E+01             CRIG=   2.00 HO2    1.00 CO
52  1.000E+02             MCRG=   0.00
53  3.400E+02             MCRG=   1.00 MEO2   1.00 OH     1.00 CO     1.00 X
54  4.250E+02             MCRG=   1.00 MEO2   1.00 HO2    1.00 X
55  8.500E+01             MCRG=   1.00 CARB   2.00 HO2    1.00 X
56  1.000E+04        OH   ARO  =   1.00 HO2    3.00 Y
57  1.600E+03        OH   ARO  =   1.00 HO2    1.00 BZA    1.00 X
58  3.000E+03        OH   ARO  =   1.00 OH     1.00 BZA    1.00 W
59  1.000E+03        CARB W    =   0.00
60  3.000E+01        NO   Y    =   1.00 NO     1.00 CARB   1.00 PAN
61  1.500E+01        NO   Y    =   1.00 NO2
62  3.500E+04        NO3  Y    =   2.00 CARB
63  6.000E-01        O3   Y    =   1.00 AERO
64  1.000E+04        OH   BZA  =   1.00 HO2    3.00 Y
65  2.025E-01             BZA  =   1.00 MEO2   1.00 HO2    3.00 Y
66  2.000E+03        OH   SO2  =   1.00 HSO3
67  8.000E+02        NO   HSO5=   1.00 NO2    1.00 HSO4
68  1.000E+04        NO2  HSO4=   1.00 AERS   1.00 HNO3
```

Figure 14 (Continued).

```
METEOROLOGICAL INPUT

OPTIONS- WSDOPT-   1
         PWSOPT-   1
         MDSOPT-   1
          KIOPT-   1
         AMBOPT-   1

                                        WIND SPEED       TIME
                                         (M/SEC)        (MIN)

                                           4.0           0.0

                                        PLUME WIDTH   DOWNWIND DISTANCE
                                           (M)              (KM)

                                          500.0             .1
                                         1000.0            1.0
                                        20000.0           30.0

                                        MIXING DEPTH  DOWNWIND DISTANCE
                                           (M)              (KM)

                                          250.0             .1
                                         1250.0            2.0
                                         1250.0           30.0

                                        KI FACTOR        TIME
                                         (/MIN)         (MIN)

                                        5.000E-01         0.0
                                        4.500E-01        40.0
                                        3.000E-01        70.0
                                        1.700E-01       120.0

                                        AMBIENT CONCENTRATIONS (PPM)

          SPECIES           TIMES (MIN)

                                0.         75        120.
           TEST            1.00E+00  1.00E+00  1.00E+00
           NO2             1.00E-02  1.00E-02  1.00E-02
           NO              4.00E-03  4.00E-03  4.00E-03
           O3              5.23E-02  6.50E-02  7.75E-02
           CO              6.00E-01  6.00E-01  6.00E-01
           PAN             6.00E-06  6.00E-06  6.00E-06
           OLE             1.10E-02  1.10E-02  1.10E-02
           CARB            2.00E-02  2.00E-02  2.00E-02
           PAR             3.30E-01  3.30E-01  3.30E-01
           ARO             1.40E-01  1.40E-01  1.40E-01
           ETH             1.10E-02  1.10E-02  1.10E-02
           BZA             8.70E-06  8.70E-06  8.70E-06
           RO2             2.00E-02  2.00E-02  2.00E-02
```

Figure 14 (Continued).

```
---------------------------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3
TIME= 1.00E+01 MIN.          CELL WIDTH= 5.000E+02 M.          CELL DEPTH= 2.500E+02 M.          KI FACTOR= 4.88E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

        1 TRAC    0.                2 TEST    1.000E+00          3 NO2     1.079E-02          4 NO      1.864E-03
        5 O3      6.500E-02         6 HO2     6.133E-05          7 CO      6.000E-01          8 PAN     5.231E-04
        9 OLE     9.876E-03        10 CARB    4.048E-02         11 PAR     3.356E-01         12 ARO     1.320E-01
       13 SO2     1.991E-02        14 HSO3    7.315E-06         15 HSO4    1.011E-07         16 ETH     1.068E-02
       17 BZA     9.719E-04
STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

       18 O       1.197E-09        19 CRIG    5.724E-09         20 MCRG    4.322E-09         21 OH      2.860E-07
       22 RAO2    3.352E-06        23 RBO2    1.615E-06         24 MEO2    1.789E-05         25 ACO3    4.313E-06
       26 NO3     4.864E-08        27 Y       1.883E-02         28 X       9.912E-09         29 W       2.813E-08
UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

       30 HNO3    4.432E-04        31 CO2     8.605E-04         32 O2      3.589E-02         33 AERS    3.016E-01
       34 AERO    4.562E-03
INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

       35 H2O     1.900E+04
---------------------------------------------------------------------------------------------------------------------------
```

Figure 14 (Continued).

```
------------------------------------------------------------------------------------------------------------
AERO CONC. IN MICRO-G/M**3

TIME= 2.00E+01 MIN.          CELL WIDTH= 5.000E+02 M.          CELL DEPTH= 2.500E+02 M.          KI FACTOR= 4.78E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

          1 TRAC     0.                  2 TEST     1.000E+00            3 NO2      9.478E-03             4 NO       1.267E-03
          5 O3       7.794E-02           6 HO2      8.069E-03            7 CO       6.021E-01             8 PAN      1.422E-03
          9 OLF      8.702E-03          10 CARB     5.324E-02           11 PAR      3.398E-01            12 ARO      1.240E-01
         13 SO2      1.908E-02          14 N2O5     9.911E-06           15 HSO4     1.060E-07            16 ETH      1.032E-02
         17 BZA      1.364E-03

STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

         18 O        1.024E-09          19 CRIC     6.142E-09           20 MCRC     4.831E-09            21 OH       2.365E-07
         22 RAO2     3.044E-06          23 RBO2     2.835E-06           24 MEO2     2.831E-05            25 ACO3     7.039E-06
         26 NO3      4.870E-08          27 Y        2.022E-02           28 X        1.030E-08            29 W        1.803E-08

UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

         30 HNO3     9.443E-04          31 CO2      1.917E-03           32 O2       6.275E-02            33 AERS     6.703E-01
         34 AERO     1.320E-02

INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

         35 H2O      1.900E+04

------------------------------------------------------------------------------------------------------------
```

```
------------------------------------------------------------------------------------------------------------
AERO CONC. IN MICRO-G/M**3

TIME= 3.00E+01 MIN.          CELL WIDTH= 5.000E+02 M.          CELL DEPTH= 2.500E+02 M.          KI FACTOR= 4.63E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

          1 TRAC     0.                  2 TEST     1.000E+00            3 NO2      8.009E-03             4 NO       9.714E-04
          5 O3       8.600E-02           6 HO2      8.401E-05            7 CO       6.038E-01             8 PAN      2.310E-03
          9 OLF      7.011E-03          10 CARB     6.220E-02           11 PAR      3.413E-01            12 ARO      1.186E-01
         13 SO2      1.971E-02          14 N2O5     1.049E-05           15 HSO4     1.010E-07            16 ETH      1.002E-02
         17 BZA      1.319E-03

STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

         18 O        8.421E-10          19 CRIC     6.206E-09           20 MCRC     4.482E-09            21 OH       2.074E-07
         22 RAO2     2.356E-06          23 RBO2     2.062E-06           24 MEO2     3.290E-05            25 ACO3     9.350E-06
         26 NO3      8.263E-08          27 Y        1.788E-02           28 X        9.616E-09            29 W        1.186E-08

UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

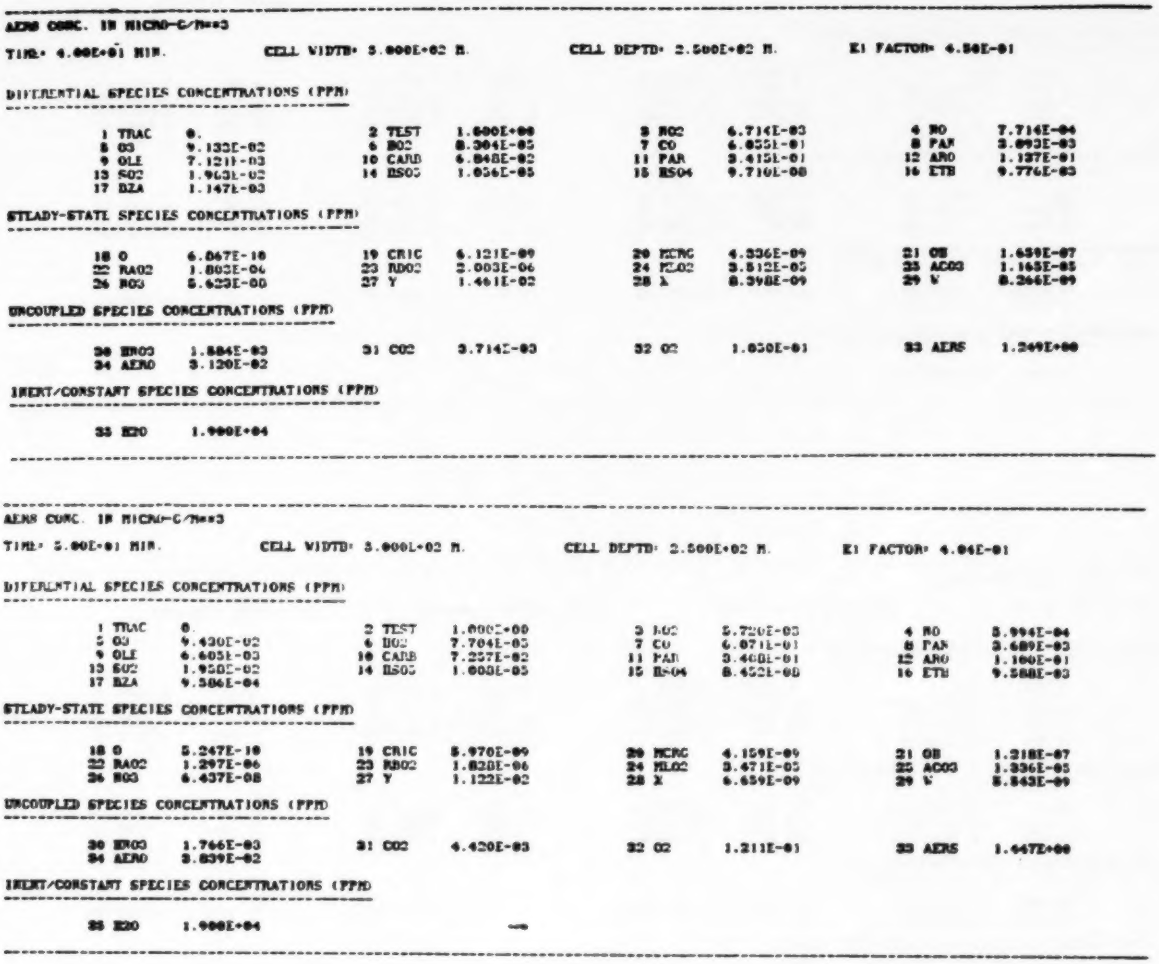
         30 HNO3     1.320E-03          31 CO2      2.878E-03           32 O2       8.552E-02            33 AERS     9.936E-01
         34 AERO     2.264E-02

INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

         35 H2O      1.900E+04

------------------------------------------------------------------------------------------------------------
```

Figure 14 (Continued).



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------------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3

TIME: 4.00E+01 MIN.         CELL WIDTH: 5.000E+02 M.          CELL DEPTH: 2.500E+02 M.        K1 FACTOR: 4.80E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

         1 TRAC     0.                 2 TEST    1.000E+00           3 NO2     6.714E-03          4 NO      7.714E-04
         5 O3       9.133E-02          6 HO2     8.304E-05           7 CO      6.055E-01          8 PAN     3.093E-03
         9 OLE      7.121E-03         10 CARB    6.848E-02          11 PAR     3.415E-01         12 ARO     1.137E-01
        13 SO2      1.963E-02         14 HSO3    1.036E-05          15 HSO4    9.710E-08         16 ETH     9.776E-03
        17 BZA      1.147E-03

STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

        18 O        6.067E-10         19 CRIC    6.121E-09          20 MCRC    4.336E-09         21 OH      1.659E-07
        22 RAO2     1.803E-06         23 RBO2    2.003E-06          24 MLO2    3.812E-05         25 ACO3    1.165E-05
        26 NO3      5.623E-08         27 Y       1.461E-02          28 X       8.398E-09         29 W       8.266E-09

UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

        30 HNO3     1.884E-03         31 CO2     3.714E-03          32 O2      1.030E-01         33 AERS    1.249E+00
        34 AERO     3.120E-02

INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

        35 H2O      1.900E+04

------------------------------------------------------------------------------------------------------------


------------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3

TIME: 5.00E+01 MIN.         CELL WIDTH: 5.000E+02 M.          CELL DEPTH: 2.500E+02 M.        K1 FACTOR: 4.04E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

         1 TRAC     0.                 2 TEST    1.000E+00           3 NO2     5.720E-03          4 NO      5.994E-04
         5 O3       9.430E-02          6 HO2     7.704E-05           7 CO      6.071E-01          8 PAN     3.689E-03
         9 OLE      6.605E-03         10 CARB    7.257E-02          11 PAR     3.408E-01         12 ARO     1.100E-01
        13 SO2      1.950E-02         14 HSO3    1.008E-05          15 HSO4    8.452E-08         16 ETH     9.588E-03
        17 BZA      9.506E-04

STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

        18 O        5.247E-10         19 CRIC    5.970E-09          20 MCRC    4.159E-09         21 OH      1.218E-07
        22 RAO2     1.297E-06         23 RBO2    1.828E-06          24 MLO2    3.471E-05         25 ACO3    1.336E-05
        26 NO3      6.437E-08         27 Y       1.122E-02          28 X       6.659E-09         29 W       5.843E-09

UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

        30 HNO3     1.766E-03         31 CO2     4.420E-03          32 O2      1.211E-01         33 AERS    1.447E+00
        34 AERO     3.839E-02

INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

        35 H2O      1.900E+04

------------------------------------------------------------------------------------------------------------
```

Figure 14 (Continued).

```
------------------------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3
TIME= 6.00E+01 MIN.        CELL WIDTH= 5.000E+02 M.        CELL DEPTH= 2.500E+02 M.        KI FACTOR= 3.82E-01

DIFERENTIAL SPECIES CONCENTRATIONS (PPM)
----------------------------------------

      1 TRAC   0.               2 TEST   1.000E+00        3 NO2    5.012E-03        4 NO     4.698E-04
      5 O3     9.561E-02        6 HO2    7.096E-05        7 CO     6.000E-01        8 PAN    4.087E-03
      9 OLE    6.233E-03       10 CARB   7.501E-02       11 PAR    3.398E-01       12 ARO    1.075E-01
     13 SO2    1.954E-02       14 HSO3   9.540E-06       15 HSO4   7.157E-08       16 ETH    9.486E-03
     17 BZA    8.072E-04
STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

     18 O      4.013E-10       19 CRIC   3.801E-09       20 MCRC   3.903E-09       21 OH     9.838E-08
     22 RAO2   9.859E-07       23 RBO2   1.676E-06       24 MEO2   3.363E-05       25 ACO3   1.479E-05
     26 NO3    7.421E-08       27 Y      8.629E-03       28 X      5.241E-09       29 W      3.888E-09
UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

     30 HNO3   1.887E-03       31 CO2    4.987E-03       32 O2     1.341E-01       33 AERS   1.594E+00
     34 AERO   4.403E-02
INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

     35 H2O    1.900E+04
------------------------------------------------------------------------------------------------------------------------
```

```
------------------------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3
TIME= 7.00E+01 MIN.        CELL WIDTH= 5.000E+02 M.        CELL DEPTH= 2.500E+02 M.        KI FACTOR= 3.08E-01

DIFERENTIAL SPECIES CONCENTRATIONS (PPM)
----------------------------------------

      1 TRAC   0.               2 TEST   1.000E+00        3 NO2    4.498E-03        4 NO     3.701E-04
      5 O3     9.608E-02        6 HO2    6.468E-05        7 CO     6.095E-01        8 PAN    4.347E-03
      9 OLE    5.932E-03       10 CARB   7.657E-02       11 PAR    3.308E-01       12 ARO    1.038E-01
     13 SO2    1.951E-02       14 HSO3   8.979E-06       15 HSO4   8.914E-08       16 ETH    9.344E-03
     17 BZA    6.941E-04
STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

     18 O      3.064E-10       19 CRIC   5.638E-09       20 MCRC   3.832E-09       21 OH     6.666E-08
     22 RAO2   7.043E-07       23 RBO2   1.521E-06       24 MEO2   3.215E-05       25 ACO3   1.899E-05
     26 NO3    8.762E-08       27 Y      6.572E-03       28 X      4.886E-09       29 W      2.761E-09
UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

     30 HNO3   1.970E-03       31 CO2    3.441E-03       32 O2     1.446E-01       33 AERS   1.702E+00
     34 AERO   4.839E-02
INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

     35 H2O    1.900E+04
------------------------------------------------------------------------------------------------------------------------
```

Figure 14 (Continued).

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----------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3

TIME= 8.00E+01 MIN.          CELL WIDTH= 5.000E+02 M.          CELL DEPTH= 2.500E+02 M.        K1 FACTOR= 2.74E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

        1 TRAC   0.                   2 TEST   1.000E+00          3 NO2    4.083E-03          4 NO     3.117E-04
        5 O3     9.610E-02            6 HO2    6.101E-05          7 CO     6.109E-01          8 PAN    4.521E-03
        9 OLE    5.721E-03           10 CARB   7.760E-02         11 PAR    3.379E-01         12 ARO    1.044E-01
       13 SO2    1.949E-02           14 HSO3   8.602E-06         15 HSO4   5.256E-08         16 ETH    9.238E-03
       17 BZA    6.069E-04
STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

       18 O      2.841E-10           19 CRIC   5.487E-09         20 MCRC   3.693E-09         21 OH     5.433E-08
       22 RAO2   5.681E-07           23 RBO2   1.431E-06         24 MEO2   3.148E-05         25 ACO3   1.739E-05
       26 NO3    9.619E-08           27 Y      5.434E-03         28 X      3.478E-09         29 W      2.190E-09
UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

       30 HNO3   2.030E-03           31 CO2    5.817E-03         32 O2     1.532E-01         33 AERS   1.785E+00
       34 AERO   5.183E-02
INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

       35 H2O    1.900E+04

----------------------------------------------------------------------------------------------------------


----------------------------------------------------------------------------------------------------------
AERS CONC. IN MICRO-G/M**3

TIME= 9.00E+01 MIN.          CELL WIDTH= 5.000E+02 M.          CELL DEPTH= 2.500E+02 M.        K1 FACTOR= 2.48E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

        1 TRAC   0.                   2 TEST   1.000E+00          3 NO2    3.756E-03          4 NO     2.644E-04
        5 O3     9.606E-02            6 HO2    5.746E-05          7 CO     6.118E-01          8 PAN    4.630E-03
        9 OLE    5.526E-03           10 CARB   7.849E-02         11 PAR    3.370E-01         12 ARO    1.033E-01
       13 SO2    1.947E-02           14 HSO3   8.320E-06         15 HSO4   4.688E-08         16 ETH    9.183E-03
       17 BZA    5.405E-04
STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

       18 O      2.114E-10           19 CRIC   5.346E-09         20 MCRC   3.567E-09         21 OH     4.443E-08
       22 RAO2   4.611E-07           23 RBO2   1.343E-06         24 MEO2   3.073E-05         25 ACO3   1.069E-05
       26 NO3    1.064E-07           27 Y      4.306E-03         28 X      2.966E-09         29 W      1.755E-09
UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

       30 HNO3   2.077E-03           31 CO2    6.146E-03         32 O2     1.606E-01         33 AERS   1.853E+00
       34 AERO   5.469E-02
INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

       35 H2O    1.900E+04

----------------------------------------------------------------------------------------------------------
```

Figure 14 (Continued).

```
-------------------------------------------------------------------------------------------------------------
AERO CONC. IN MICRO-G/M**3

TIME: 1.00E+02 MIN.          CELL WIDTH: 5.000E+02 M.          CELL DEPTH: 2.500E+02 M.        K1 FACTOR: 2.22E-01

DIFFERENTIAL SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

         1 TRAC    0.                2 TEST    1.000E+00           3 NO2     3.495E-03           4 NO      2.246E-04
         5 O3      9.379E-02         6 HO2     5.401E-05           7 CO      6.126E-01           8 PAN     4.711E-03
         9 OLE     5.337E-03        10 CARB    7.912E-02          11 PAR     3.362E-01          12 ARO     1.024E-01
        13 SO2     1.945E-02        14 DSLS    8.043E-06          15 HSO4    4.136E-06          16 ETH     9.122E-03
        17 BZA     4.883E-04

STEADY-STATE SPECIES CONCENTRATIONS (PPM)
-----------------------------------------

        18 O       1.760E-10        19 CRIC    5.216E-09          20 MCRG    3.452E-09          21 OH      3.646E-08
        22 RAO2    3.753E-07        23 TLO2    1.261E-06          24 MLO2    2.986E-05          25 ACO3    1.982E-05
        26 NO3     1.109E-07        27 Y       3.734E-03          28 X       2.528E-09          29 W       1.415E-09

UNCOUPLED SPECIES CONCENTRATIONS (PPM)
--------------------------------------

        30 HNO3    2.113E-03        31 CO2     6.433E-03          32 O2      1.669E-01          33 AERS    1.909E+00
        34 AERO    5.706E-02

INERT/CONSTANT SPECIES CONCENTRATIONS (PPM)
-------------------------------------------

        35 H2O     1.900E+04

-------------------------------------------------------------------------------------------------------------
```

Figure 14 (Continued).

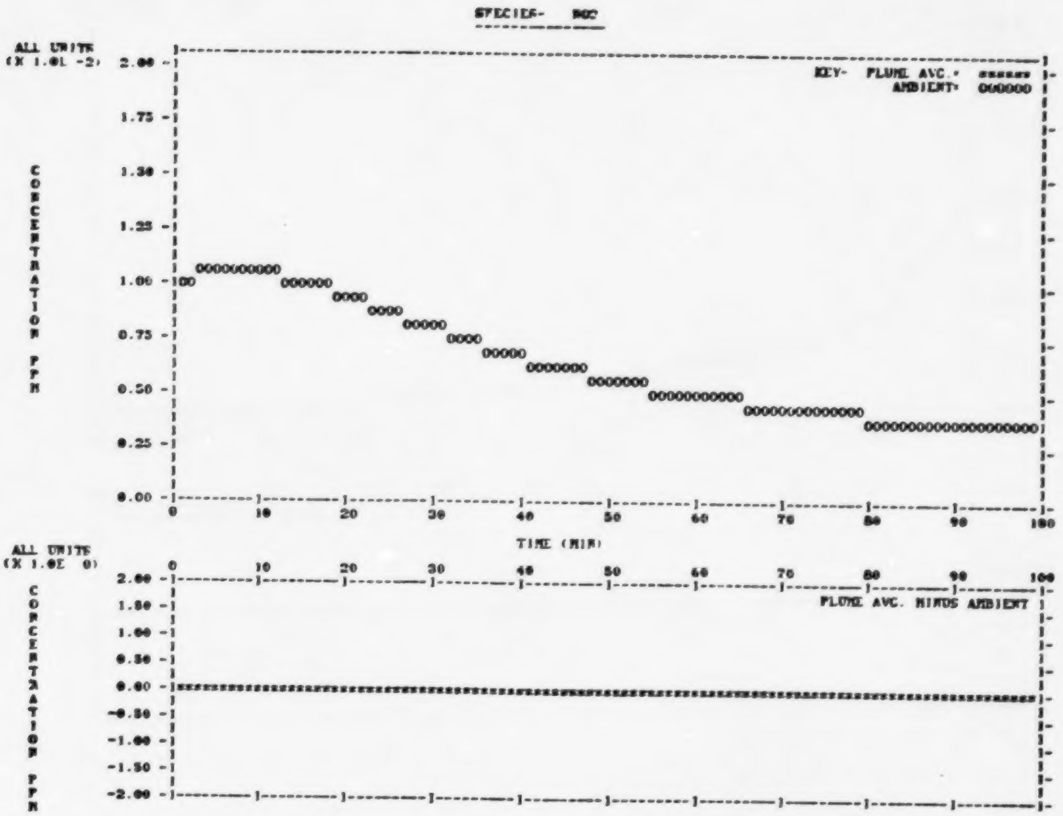

Figure 14 (Continued).

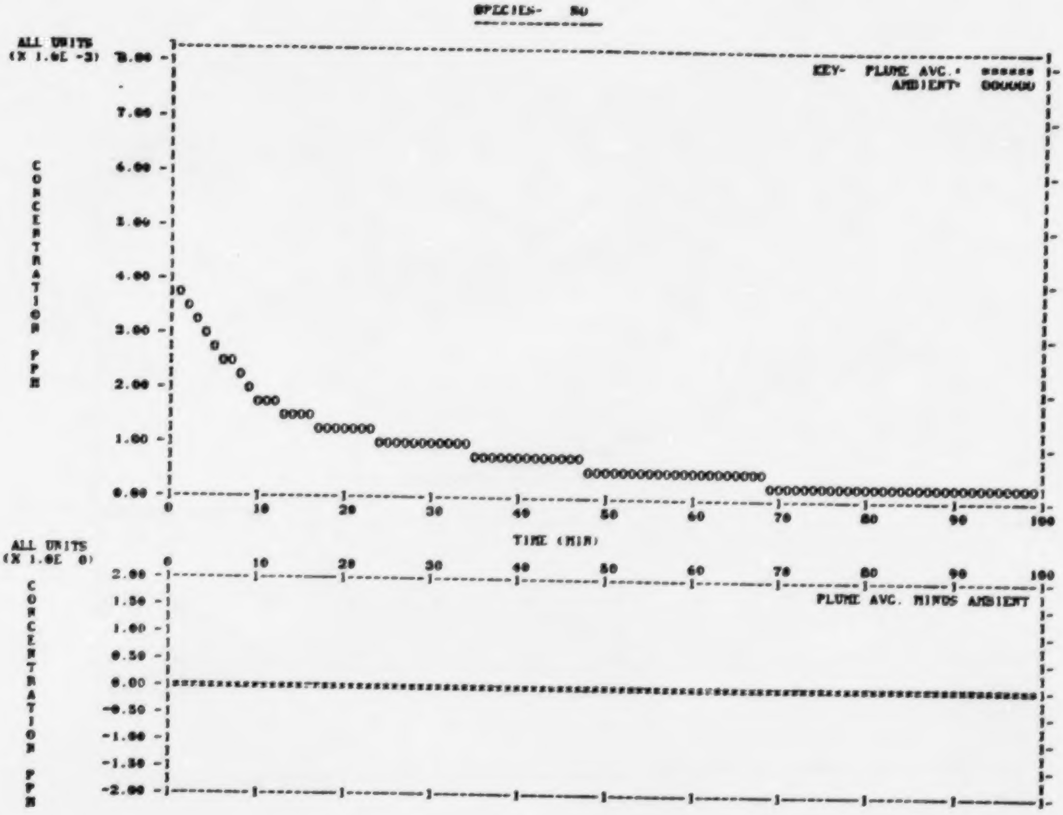

Figure 14 (Continued).

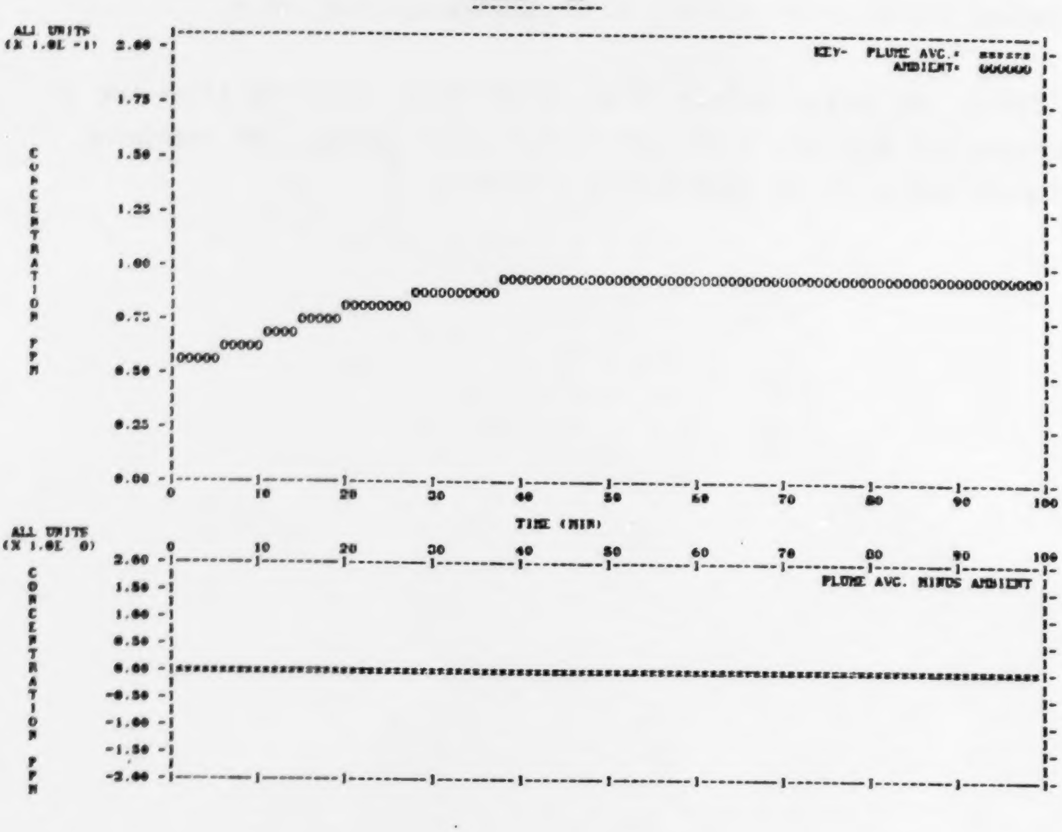

Figure 14 (Concluded).

Output No. 3, shown in Figure 15, has the same general format as the previous two printouts, except that the ambient concentrations to be used for the plume phase are listed after the conclusion of the first phase of the simulation (the ambient phase). One additional difference concerns the use of emissions injections: Two sources are injected during this simulation, the first of which has been input in units of ppm m^3/sec. The second source has been input in units of g/sec, along with the parameters necessary for conversion to model-compatible units.

During the initialization of the plume phase, injection times are calculated and displayed after the ambient phase output. The remaining portion of output is the same as with Sample No. 1.

```
RPM-II ... TEST DATA NO. 3

SIMULATION MODES-            MODE1= 1
                             MODE2= 3
                             MODE3= 3

        WHERE...  MODE1= 1 -SINGLE PLUME SIMULATION
                         2 -MULTIPLE PLUME SIMULATION

                  MODE2= 1 -AMBIENT SIMULATION ONLY (EG. SMOG CHAMBER)
                         2 -PLUME SIMULATION ONLY (AMBIENT CONCENTRATIONS MUST BE INPUT)
                         3 -AMBIENT SIMULATION FOLLOWED BY PLUME RUN

                  MODE3= 1 -NEAR SOURCE SIMULATION (ELLIPTICAL CROSS SECTIONS)
                         2 -NEAR SOURCE MERGING TO FAR SOURCE
                         3 -FAR SOURCE SIMULATION (VERTICALLY UNIFORM CONCEN  TRATIONS ASSUMED)

       -NOTE-  1) MODE1=2 CAN ONLY OPERATE WITH MODE3=3
               2) MODE1=2 NOT AVAILABLE AT THIS TIME
               3) MODE3=1+2 ALSO NOT YET AVAILABLE

OUTPUT IS NOT TO BE SAVED ON DISK

PRINTED OUTPUT INTERVAL IS  1.000E+01 MIN.

MODEL SIMULATION BEGINS AT  1.000E+02 METERS AND ENDS AT  1.000E+02 MIN. OR  3.500E+04 METERS, WHICH EVER OCCURS FIRST
                            0.        MIN.

PLUME PARAMETERS   1) NO. OF CELLS (RECTANGULAR APPROXIMATION)=10
                   2) NO. OF CELLS (ELLIPTICAL APPROXIMATION)=  NOT APPLICABLE
                   3) TOTAL PLUME WIDTH (HEIGHT) IN MULTIPLES OF SIGMA-Y (SIGMA-Z)= 4.00
                   4) LENGTH SCALE FOR DIFFUSION ACROSS PLUME BOUNDARY=  1.0 X WIDTH OF OUTER CELL

NUMERICAL CONTROLS 1) STARTING TIME STEP= 1.000E-16
                   2) MINIMUM TIME STEP=  1.000E-16
                   3) MAXIMUM TIME STEP=  1.000E+01
                   4) TOLERANCE (STEADY-STATE CALCULATION)=  5.000E-03
                   5) RELATIVE ERROR BOUND (ODE SOLVER)   =  5.000E-03

HALF OPTION (FOR SYMMETRIC PLUME) -  F

NOTE- SULFATE AEROSOL (AERS) CONCENTRATIONS ARE EXPRESSED IN MICRO-GRAMS PER METER CUBED
```

Figure 15. Sample Output No. 3

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```
CHEMISTRY INPUT ..... CARBON BOND MECHANISM UPDATED 1978

NUMBER OF REACTIONS                         -  38
NUMBER OF DIFFERENTIAL SPECIES (D)          -  17
NUMBER OF STEADY-STATE SPECIES (S)          -  12
NUMBER OF UNCOUPLED SPECIES (U)             -   5
NUMBER OF INERT OR CONSTANT SPECIES (I)-    1
NUMBER OF ENTRAINED SPECIES                 -  13

 SPECIES  SPECIES  SPECIES         SPECIES  SPECIES  SPECIES         SPECIES  SPECIES  SPECIES         SPECIES  SPECIES  SPECIES
   NO.     NAME     TYPE             NO.     NAME     TYPE             NO.     NAME     TYPE             NO.     NAME     TYPE

    1      TRAC      D                2      TEST      D                3      NO2       D                4      NO        D
    5      O3        D                6      HO2       D                7      CO        D                8      PAN       D
    9      OLE       D               10      CARB      D               11      PAR       D               12      ARO       D
   13      SO2       D               14      HSO3      D               15      HSO4      D               16      ETH       D
   17      BZA       D               18      O         S               19      CRIG      S               20      MCRG      S
   21      OH        S               22      RAO2      S               23      RBO2      S               24      MEO2      S
   25      ACO3      S               26      NO3       S               27      Y         S               28      X         S
   29      N         S               30      HNO3      U               31      CO2       U               32      O2        U
   33      AERS      U               34      AERO      U               35      H2O       I

                                    CHEMICAL REACTIONS

              RATE CONST.         REACTANTS           PRODUCTS

           1  1.000E+00                 NO2 =  1.00 NO     1.00 O
           2  4.400E+06                 O   =  1.00 O3
           3  2.390E+01           NO    O3  =  1.00 NO2    1.00 O2
           4  4.800E-02           NO2   O3  =  1.00 NO3    1.00 O2
           5  1.340E+04           NO2   O   =  1.00 NO     1.00 O2
           6  7.700E+01           OH    O3  =  1.00 HO2    1.00 O2
           7  3.000E+00           HO2   O3  =  1.00 OH     2.00 O2
           8  1.400E+04           OH    NO2 =  1.00 HNO3
           9  4.400E+02           OH    CO  =  1.00 HO2    1.00 CO2
          10  1.500E-04           NO    NO  =  2.00 NO2
          11  2.800E+04           NO    NO3 =  2.00 NO2
          12  3.100E-03     H2O   NO2   NO3 =  2.00 HNO3
          13  1.200E+04           NO    HO2 =  1.00 NO2    1.00 OH
          14  1.500E-04           HO2   HO2 =  0.00
          15  2.000E+01           O     PAR =  1.00 MEO2   1.00 OH
          16  1.300E+03           OH    PAR =  1.00 MEO2
          17  2.700E+03           O     OLE =  1.00 MEO2   1.00 ACO3   1.00 X
          18  2.700E+03           O     OLE =  1.00 CARB   1.00 PAR
          19  4.200E+04           OH    OLE =  1.00 RAO2
          20  8.000E-03           O3    OLE =  1.00 CARB   1.00 CRIG
          21  8.000E-03           O3    OLE =  1.00 CARB   1.00 MCRG   1.00 X
          22  6.000E+02           O     ETH =  1.00 MEO2   1.00 HO2    1.00 CO
          23  6.000E+02           O     ETH =  1.00 CARB   1.00 PAR
          24  1.200E+04           OH    ETH =  1.00 RBO2
          25  2.400E-03           O3    ETH =  1.00 CARB   1.00 CRIG
          26  3.800E+03           NO    ACO3=  1.00 NO2    1.00 MEO2   1.00 CO2
          27  1.200E+04           NO    RBO2=  1.00 NO2    2.00 CARB   1.00 HO2
          28  1.200E+04           NO    RAO2=  1.00 NO2    2.00 CARB   1.00 HO2
          29  4.000E+03           NO    MEO2=  1.00 NO2    1.00 CARB   1.00 MEO2   1.00 X
          30  8.000E+03           NO    MEO2=  1.00 NO2    1.00 CARB   1.00 HO2
          31  5.000E+02           NO    MEO2=  0.00
          32  5.000E+00           O3    RBO2=  2.00 CARB   1.00 HO2
          33  2.000E+02           O3    RAO2=  2.00 CARB   1.00 HO2
          34  5.000E+00           O3    MEO2=  1.00 CARB   1.00 HO2
          35  1.900E+04           OH    CARB=   .50 HO2     .50 CO      .50 ACO3    .50 X
          36  1.350E-03                 CARB=  1.00 CO
          37  2.025E-03                 CARB=  1.50 HO2     .50 MEO2    .50 X      1.00 CO
          38  1.000E+05           PAR   X   =  0.00
```

Figure 15 (Continued).

```
39  2.000E+03          NO2  ACO3=  1.00 PAN
40  2.800E-02               PAN =  1.00 NO2   1.00 ACO3
41  4.000E+03          NO2  ACO3=  0.00
42  4.000E+03          NO2  MEO2=  0.00
43  1.200E+04          NO   CRIC=  1.00 NO2   1.00 CARB
44  8.000E+03          NO2  CRIC=  1.00 NO3   1.00 CARB
45  2.000E+03          CARB CRIC=  0.00
46  1.200E+04          NO   MCRC=  1.00 NO2   1.00 CARB
47  6.000E+03          NO2  MCRC=  1.00 NO3   1.00 CARB
48  2.000E+03          CARB MCRC=  0.00
49  6.700E+02               CRIC=  1.00 CO
50  2.400E+02               CRIC=  0.00
51  9.000E+01               CRIC=  2.00 HO2   1.00 CO
52  1.500E+02               MCRC=  0.00
53  3.400E+02               MCRC=  1.00 MEO2  1.00 OH    1.00 CO    1.00 X
54  4.250E+02               MCRC=  1.00 MEO2  1.00 HO2   1.00 X
55  8.500E-01               MCRC=  1.00 CARB  2.00 HO2   1.00 X
56  1.800E+04          OH   ARO =  1.00 HO2   3.00 Y
57  1.600E+03          OH   ARO =  1.00 NO2   1.00 BZA   1.00 X
58  3.000E+03          OH   ARO =  1.00 OH    1.00 BZA   1.00 X
59  1.000E+05          CARB Y   =  0.00
60  3.000E+01          NO   Y   =  1.00 NO    1.00 CARB  1.00 PAR
61  1.500E+01          NO   Y   =  1.00 NO2
62  3.500E+04          NO3  Y   =  2.00 CARB
63  6.000E-01          O3   Y   =  1.00 AERO
64  1.000E+04          OH   BZA =  1.00 HO2   3.00 Y
65  2.025E-01               BZA =  1.00 MEO2  1.00 HO2   3.00 Y
66  2.000E+03          OH   SO2 =  1.00 HSO5
67  8.000E+02          NO   HSO5=  1.00 NO2   1.00 HSO4
68  1.000E+04          NO2  HSO4=  1.00 AERS  1.00 HNO3




EMISSIONS INPUT


 SOURCE # 1          DOWNWIND DISTANCE-    .2 KM

         SPECIES    SPECIES NO.            EMISSION RATE
           NO2           3                 8.000E+02 (PPM*M3/SEC)
           NO            4                 7.000E+03 (PPM*M3/SEC)
           SO2          13                 2.000E+03 (PPM*M3/SEC)
 SOURCE # 2          DOWNWIND DISTANCE-    .4 KM

         SPECIES    SPECIES NO.            EMISSION RATE
           NO2           3                 2.000E-00 (CM/SEC)                1.119E+03 (PPM*M3/SEC)
           NO            4                 8.000E-00 (CM/SEC)                7.000E+03 (PPM*M3/SEC)
           SO2          13                 7.500E-01 (CM/SEC)                2.000E+04 (PPM*M3/SEC)
```

Figure 15 (Continued).

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```
METEOROLOGICAL INPUT

OPTIONS- WNDOPT-  1
         WIDOPT-  2
         HMXOPT-  1
          K1OPT-  1
         AMBOPT-  1

                              WIND SPEED        TIME
                               (M/SEC)          (MIN)

                                 4.0             0.0

                             PLUME WIDTH    DOWNWIND DISTANCE
                                 (M)              (KM)

                                 18.4              .1
                                525.2             4.0
                                970.9             7.9
                               1394.8            11.7
                               1803.1            15.6
                               2205.5            19.5
                               2598.2            23.4
                               2984.5            27.2
                               3365.6            31.1
                               3742.1            35.0

                             MIXING DEPTH   DOWNWIND DISTANCE
                                 (M)              (KM)

                                250.0              .1
                               1250.0             2.0
                               1250.0            30.0

                              K1 FACTOR          TIME
                              (/MIN)             (MIN)

                              5.000E-01           0.0
                              4.500E-01          40.0
                              3.000E-01          70.0
                              1.700E-01         120.0

                              AMBIENT CONCENTRATIONS (PPM)

           SPECIES       TIMES (MIN)

                                0.        75.        120.
            TEST         1.00E+00  1.00E+00  1.00E+00
            NO2          1.00E-02  1.00E-02  1.00E-02
            NO           4.00E-03  4.00E-03  4.00E-03
            O3           5.23E-02  6.50E-02  7.75E-02
            CO           6.00E-01  6.00E-01  6.00E-01
            PAN          6.00E-06  6.00E-06  6.00E-06
            OLE          1.10E-03  1.10E-03  1.10E-03
            CARB         2.80E-02  2.80E-02  2.80E-02
            PAR          3.30E-01  3.30E-01  3.30E-01
            ARO          1.40E-01  1.40E-01  1.40E-01
            ETH          1.10E-02  1.10E-02  1.10E-02
            BZA          8.70E-06  8.70E-06  8.70E-06
            SO2          2.00E-02  2.00E-02  2.00E-02
```

Figure 15 (Continued).

```
                    CALCULATED AMBIENT CONCENTRATIONS FOR USE IN THE FOLLOWING PLUME SIMULATION(S)
                    ------------------------------------------------------------------------------

SPECIES  SPECIES                                           AMBIENT TIMES (MIN)
  NO.      NAME     0.         1.14E+01   2.60E+01   3.39E+01   4.92E+01   5.97E+01   6.90E+01   7.83E+01   9.22E+01   1.03E+02

   2       TEST     1.000E+00  1.000E+00  1.000E+00  1.000E+00  1.000E+00  1.000E+00  1.000E+00  1.000E+00  1.000E+00  1.000E+00
   3       NO2      1.000E-02  1.067E-02  8.874E-03  7.467E-03  5.763E-03  4.988E-03  4.479E-03  4.064E-03  3.599E-03  3.363E-03
   4       NO       4.000E-03  1.736E-03  1.069E-03  8.811E-04  6.046E-04  4.608E-04  3.715E-04  3.150E-04  2.488E-04  2.125E-04
   5       O3       8.330E-02  6.711E-02  8.339E-02  8.861E-02  9.431E-02  9.595E-02  9.650E-02  9.667E-02  9.633E-02  9.631E-02
   7       CO       6.000E-01  6.009E-01  6.031E-01  6.044E-01  6.070E-01  6.085E-01  6.097E-01  6.108E-01  6.121E-01  6.139E-01
   8       PAN      6.000E-04  6.334E-04  1.976E-03  2.644E-03  3.665E-03  4.101E-03  4.366E-03  4.546E-03  4.714E-03  4.777E-03
   9       OLE      1.100E-02  9.701E-03  8.129E-03  7.806E-03  6.618E-03  6.215E-03  5.938E-03  5.712E-03  5.433E-03  5.276E-03
  10       CARB     2.000E-02  4.243E-02  5.914E-02  6.513E-02  7.257E-02  7.835E-02  7.643E-02  7.803E-02  7.920E-02  7.977E-02
  11       PAR      3.390E-01  3.364E-01  3.410E-01  3.416E-01  3.410E-01  3.401E-01  3.391E-01  3.382E-01  3.369E-01  3.362E-01
  12       ARO      1.400E-01  1.316E-01  1.208E-01  1.164E-01  1.101E-01  1.074E-01  1.086E-01  1.042E-01  1.027E-01  1.018E-01
  16       ETH      1.100E-02  1.063E-02  1.013E-02  9.914E-03  9.595E-03  9.445E-03  9.341E-03  9.234E-03  9.151E-03  9.093E-03
  17       B/A      8.700E-06  1.00[illegible]E-03  1.30[illegible]E-03  1.271E-03  9.792E-04  8.0[illegible]E-04  6.96[illegible]E-04  6.09[illegible]E-04  5.124E-04  4.643E-04
  13       SO2      2.000E-02  1.989E-02  1.974E-02  1.963E-02  1.958E-02  1.954E-02  1.951E-02  1.948E-02  1.946E-02  1.944E-02
INJECTION TIME FOR SOURCE NO.  1 IS  8.333E-01 MIN.

INJECTION TIME FOR SOURCE NO.  2 IS  1.667E+00 MIN.



      PLUME GEOMETRY
      CELL NO.   1  WIDTH FACTOR=   8.160E-01, CENTERLINE FACTOR=  -1.592E+00, BOUNDARY FACTOR=  -2.000E+00
      CELL NO.   2  WIDTH FACTOR=   3.902E-01, CENTERLINE FACTOR=  -9.889E-01, BOUNDARY FACTOR=  -1.184E+00
      CELL NO.   3  WIDTH FACTOR=   2.954E-01, CENTERLINE FACTOR=  -6.461E-01, BOUNDARY FACTOR=  -7.938E-01
      CELL NO.   4  WIDTH FACTOR=   2.568E-01, CENTERLINE FACTOR=  -3.700E-01, BOUNDARY FACTOR=  -4.984E-01
      CELL NO.   5  WIDTH FACTOR=   2.416E-01, CENTERLINE FACTOR=  -1.200E-01, BOUNDARY FACTOR=  -2.416E-01
      CELL NO.   6  WIDTH FACTOR=   2.416E-01, CENTERLINE FACTOR=   1.200E-01, BOUNDARY FACTOR=   0.
      CELL NO.   7  WIDTH FACTOR=   2.568E-01, CENTERLINE FACTOR=   3.700E-01, BOUNDARY FACTOR=   2.416E-01
      CELL NO.   8  WIDTH FACTOR=   2.954E-01, CENTERLINE FACTOR=   6.461E-01, BOUNDARY FACTOR=   4.984E-01
      CELL NO.   9  WIDTH FACTOR=   3.902E-01, CENTERLINE FACTOR=   9.889E-01, BOUNDARY FACTOR=   7.938E-01
      CELL NO.  10  WIDTH FACTOR=   8.160E-01, CENTERLINE FACTOR=   1.592E+00, BOUNDARY FACTOR=   1.184E+00
      INDEX NO. 11                                                             BOUNDARY FACTOR=   2.000E+00
```

Figure 15 (Continued).

```
--------------------------------------------------------------------------------------------------------------------------------

 TIME= 0.        MIN.            PLUME WIDTH= 1.887E+01 M.     SIGMA Y= 4.710E+00 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 1.00E+02 METERS           PLUME DEPTH= 2.500E+02 M.                                KI FACTOR= 5.00E-01
AER- CONC. IN MICRO-G/M**3


                               PLUME     PLUME-                                         CELLS
   SPECIES     AMBIENT        AVE.       AMB       ------------------------------------------------------------------------------------------------------
                                                      1         2         3         4         5         6         7         8         9         10
 1 TRAC (D) 0.              1.00E+00  1.000E+00   4.90E-01  1.03E+00  1.35E+00  1.56E+00  1.66E+00  1.66E+00  1.56E+00  1.35E+00  1.03E+00  4.90E-01
 2 TEST (D) 1.00E+00        1.00E+00  0.          1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
 3 NO2  (D) 1.00E-02        1.00E-02  0.          1.00E-02  1.00E-02  1.00E-02  1.00E-02  1.00E-02  1.00E-02  1.00E-02  1.00E-02  1.00E-02  1.00E-02
 4 NO   (D) 4.00E-03        4.00E-03  0.          4.00E-03  4.00E-03  4.00E-03  4.00E-03  4.00E-03  4.00E-03  4.00E-03  4.00E-03  4.00E-03  4.00E-03
 5 O3   (D) 5.23E-02        5.23E-02  0.          5.23E-02  5.23E-02  5.23E-02  5.23E-02  5.23E-02  5.23E-02  5.23E-02  5.23E-02  5.23E-02  5.23E-02
 6 NO2  (D) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
 7 CO   (D) 6.00E-01        6.00E-01  0.          6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01
 8 PAN  (D) 6.00E-06        6.00E-06  0.          6.00E-06  6.00E-06  6.00E-06  6.00E-06  6.00E-06  6.00E-06  6.00E-06  6.00E-06  6.00E-06  6.00E-06
 9 OLE  (D) 1.10E-02        1.10E-02  0.          1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02
10 CARB (D) 2.80E-02        2.80E-02  0.          2.80E-02  2.80E-02  2.80E-02  2.80E-02  2.80E-02  2.80E-02  2.80E-02  2.80E-02  2.80E-02  2.80E-02
11 PAR  (D) 3.30E-01        3.30E-01  0.          3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01
12 ARO  (D) 1.40E-01        1.40E-01  0.          1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01
13 SO2  (D) 2.00E-02        2.00E-02  0.          2.00E-02  2.00E-02  2.00E-02  2.00E-02  2.00E-02  2.00E-02  2.00E-02  2.00E-02  2.00E-02  2.00E-02
14 HONO (D) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
15 HNO4 (D) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
16 ETH  (D) 1.10E-02        1.10E-02  0.          1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02
17 BZA  (D) 8.70E-06        8.70E-06  0.          8.70E-06  8.70E-06  8.70E-06  8.70E-06  8.70E-06  8.70E-06  8.70E-06  8.70E-06  8.70E-06  8.70E-06
18 O    (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
19 CRIC (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
20 MCRG (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
21 OH   (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
22 RAO2 (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
23 RBO2 (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
24 MEO2 (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
25 ACO3 (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
26 NO3  (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
27 Y    (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
28 X    (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
29 V    (S) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
30 HNO3 (U) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
31 CO2  (U) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
32 O2   (U) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
33 AERS (U) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
34 AERO (U) 0.              0.        0.          0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
35 H2O  (I) 0.              1.90E+04  1.900E+04   1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04
                                                                                 CELLS
                                ------------------------------------------------------------------------------------------------------
                                    1          2          3          4          5          6          7          8          9          10
       CELL DEPTHS (M)          2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02   2.50E+02
       CELL WIDTHS (M)          3.85E+00   1.84E+00   1.39E+00   1.21E+00   1.14E+00   1.14E+00   1.21E+00   1.39E+00   1.84E+00   3.85E+00
  CELL CENTERLINES (M)         -7.51E+00  -4.67E+00  -3.05E+00  -1.75E+00  -5.70E-01   5.70E-01   1.75E+00   3.05E+00   4.67E+00   7.51E+00

  CELL BOUNDARIES (M)   -9.44E+00  -5.59E+00  -3.75E+00  -2.35E+00  -1.14E+00   0.         1.14E+00   2.35E+00   3.75E+00   5.59E+00   9.44E+00
 DIFFUSIVITIES (M2/S)   0.         0.         0.         0.         0.         0.         0.         0.         0.         0.         0.
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Figure 15 (Continued).

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 TIME: 8.33E-01 MIN          PLUME WIDTH: 4.490E+01 M.      SIGMA Y: 1.125E+01 M.      WIND SPEED: 4.00E+00 M/SEC
FETCH: 3.00E+02 METERS       PLUME DEPTH: 3.553E+02 M.                                   KI FACTOR: 4.99E-01
AERS CONC. IN MICRO-G/M**3

                                                                               CELLS
                        PLUME     PLUME-    ----------------------------------------------------------------------------------------------
  SPECIES     AMBIENT    AVE.      AMB          1         2         3         4         5         6         7         8         9        10
 1 TRAC (D) 0.         2.95E-01  2.951E-01  1.43E-01  3.03E-01  4.00E-01  4.60E-01  4.89E-01  4.89E-01  4.60E-01  4.00E-01  3.03E-01  1.43E-01
 2 TEST (D) 1.00E+00  1.00E+00 -5.684E-14  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
 3 NO2  (D) 1.00E-02  2.27E-02  1.269E-02  1.63E-02  2.31E-02  2.72E-02  2.98E-02  3.10E-02  3.10E-02  2.98E-02  2.72E-02  2.31E-02  1.63E-02
 4 NO   (D) 3.82E-03  1.13E-01  1.094E-01  8.74E-02  1.16E-01  1.52E-01  1.74E-01  1.85E-01  1.85E-01  1.74E-01  1.52E-01  1.16E-01  8.74E-02
 5 O3   (D) 5.32E-02  5.26E-02 -5.71[illegible]-04  5.24E-02  5.26E-02  5.27E-02  5.27E-02  5.27E-02  5.27E-02  5.27E-02  5.27E-02  5.26E-02  5.24E-02
 6 HO2  (D) 0.         1.36E-05  1.358E-05  1.21E-05  1.40E-05  1.46E-05  1.49E-05  1.51E-05  1.51E-05  1.49E-05  1.46E-05  1.40E-05  1.21E-05
 7 CO   (D) 6.00E-01  6.00E-01 -1.394E-05  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01  6.00E-01
 8 FAR  (D) 5.22E-05  3.13E-05 -2.088E-05  3.60E-05  3.03E-05  2.80E-05  2.68E-05  2.63E-05  2.63E-05  2.68E-05  2.80E-05  3.03E-05  3.60E-05
 9 OLE  (D) 1.09E-02  1.09E-02  3.085E-05  1.09E-02  1.09E-02  1.09E-02  1.09E-02  1.09E-02  1.09E-02  1.09E-02  1.09E-02  1.09E-02  1.09E-02
10 CARB (D) 2.91E-02  2.85E-02 -5.724E-04  2.86E-02  2.85E-02  2.84E-02  2.84E-02  2.83E-02  2.83E-02  2.84E-02  2.84E-02  2.85E-02  2.86E-02
11 PAR  (D) 3.30E-01  3.30E-01 -3.413E-04  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01  3.30E-01
12 ARO  (D) 1.40E-01  1.40E-01  2.172E-04  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01  1.40E-01
13 SO2  (D) 2.00E-02  5.13E-02  3.129E-02  3.53E-02  5.21E-02  6.24E-02  6.87E-02  7.18E-02  7.18E-02  6.87E-02  6.24E-02  5.21E-02  3.53E-02
14 HSO5 (D) 0.         1.04E-06  1.044E-06  8.08E-07  1.10E-06  1.22E-06  1.27E-06  1.30E-06  1.30E-06  1.27E-06  1.22E-06  1.10E-06  8.08E-07
15 HSO4 (D) 0.         2.96E-08  2.962E-08  2.31E-08  3.12E-08  3.44E-08  3.59E-08  3.66E-08  3.66E-08  3.59E-08  3.44E-08  3.12E-08  2.31E-08
16 ETH  (D) 1.10E-02  1.10E-02  9.276E-06  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02  1.10E-02
17 BZA  (D) 8.65E-05  6.95E-05 -1.702E-05  7.21E-05  6.87E-05  6.76E-05  6.72E-05  6.70E-05  6.70E-05  6.72E-05  6.76E-05  6.87E-05  7.21E-05
18 O    (S) 0.         1.16E-09  1.160E-09  1.15E-09  1.16E-09  1.16E-09  1.17E-09  1.17E-09  1.17E-09  1.17E-09  1.16E-09  1.16E-09  1.15E-09
19 CRIG (S) 0.         5.08E-09  5.077E-09  5.09E-09  5.07E-09  5.07E-09  5.07E-09  5.07E-09  5.07E-09  5.07E-09  5.07E-09  5.07E-09  5.09E-09
20 MCRG (S) 0.         3.90E-09  3.901E-09  3.91E-09  3.90E-09  3.90E-09  3.90E-09  3.89E-09  3.89E-09  3.90E-09  3.90E-09  3.90E-09  3.91E-09
21 OH   (S) 0.         1.26E-07  1.264E-07  1.15E-07  1.30E-07  1.35E-07  1.37E-07  1.39E-07  1.39E-07  1.37E-07  1.35E-07  1.30E-07  1.15E-07
22 RAO2 (S) 0.         1.04E-06  1.037E-06  9.31E-07  1.07E-06  1.11E-06  1.14E-06  1.15E-06  1.15E-06  1.14E-06  1.11E-06  1.07E-06  9.31E-07
23 RBO2 (S) 0.         3.65E-07  3.645E-07  3.27E-07  3.75E-07  3.91E-07  4.00E-07  4.03E-07  4.03E-07  4.00E-07  3.91E-07  3.75E-07  3.27E-07
24 MEO2 (S) 0.         3.07E-06  3.070E-06  2.85E-06  3.14E-06  3.23E-06  3.28E-06  3.30E-06  3.30E-06  3.28E-06  3.23E-06  3.14E-06  2.85E-06
25 ACO3 (S) 0.         9.85E-07  9.855E-07  9.83E-07  1.01E-06  1.04E-06  1.06E-06  1.07E-06  1.07E-06  1.06E-06  1.04E-06  1.01E-06  9.83E-07
26 NO3  (S) 0.         2.02E-07  2.024E-07  2.04E-07  2.02E-07  2.01E-07  2.01E-07  2.00E-07  2.00E-07  2.01E-07  2.01E-07  2.02E-07  2.04E-07
27 Y    (S) 0.         7.75E-04  7.747E-04  7.03E-04  7.95E-04  8.26E-04  8.42E-04  8.49E-04  8.49E-04  8.42E-04  8.26E-04  7.95E-04  7.03E-04
28 X    (S) 0.         3.94E-09  3.939E-09  3.68E-09  4.02E-09  4.12E-09  4.18E-09  4.20E-09  4.20E-09  4.18E-09  4.12E-09  4.02E-09  3.68E-09
29 W    (S) 0.         1.86E-08  1.858E-08  1.67E-08  1.91E-08  1.99E-08  2.03E-08  2.05E-08  2.05E-08  2.03E-08  1.99E-08  1.91E-08  1.67E-08
30 HNO3 (U) 0.         8.88E-06  8.882E-06  6.46E-06  9.35E-06  1.06E-05  1.13E-05  1.16E-05  1.16E-05  1.13E-05  1.06E-05  9.35E-06  6.46E-06
31 CO2  (U) 0.         2.05E-05  2.053E-05  1.51E-05  2.16E-05  2.44E-05  2.59E-05  2.65E-05  2.65E-05  2.59E-05  2.44E-05  2.16E-05  1.51E-05
32 O2   (U) 0.         2.62E-03  2.616E-03  2.01E-03  2.75E-03  3.05E-03  3.21E-03  3.27E-03  3.27E-03  3.21E-03  3.05E-03  2.75E-03  2.01E-03
33 AERS (U) 0.         3.73E-03  3.732E-03  2.55E-03  3.94E-03  4.58E-03  4.92E-03  5.08E-03  5.08E-03  4.92E-03  4.58E-03  3.94E-03  2.55E-03
34 AERO (U) 0.         9.04E-06  9.041E-06  6.82E-06  9.51E-06  1.07E-05  1.12E-05  1.15E-05  1.15E-05  1.12E-05  1.07E-05  9.51E-06  6.82E-06
35 H2O  (I) 0.         1.90E+04  1.900E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04

                                                                         CELLS
                                  ------------------------------------------------------------------------------------------
                                       1          2          3          4          5          6          7          8          9          10
      CELL DEPTHS (M)              3.55E+02   3.55E+02   3.55E+02   3.55E+02   3.55E+02   3.55E+02   3.55E+02   3.55E+02   3.55E+02   3.55E+02
      CELL WIDTHS (M)              9.18E+00   4.39E+00   3.32E+00   2.89E+00   2.72E+00   2.72E+00   2.89E+00   3.32E+00   4.39E+00   9.18E+00
CELL CENTERLINES (M)              -1.79E+01  -1.11E+01  -7.27E+00  -4.16E+00  -1.36E+00   1.36E+00   4.16E+00   7.27E+00   1.11E+01   1.79E+01

 CELL BOUNDARIES (M)  -2.25E+01 -1.33E+01 -8.93E+00 -5.61E+00 -2.72E+00  0.           2.72E+00   5.61E+00   8.93E+00   1.33E+01   2.25E+01
DIFFUSIVITIES (M2/S)   0.         9.61E-01  1.25E+00  1.34E+00  1.40E+00  0.           1.40E+00   1.34E+00   1.25E+00   9.61E-01   0.
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Figure 15 (Continued).

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 TIME: 1.67E+00 HR.          PLUME WIDTH: 7.110E+01 M.     SIGMA Y: 1.777E+01 M.     WIND SPEED: 4.00E+00 M/SEC
FETCH: 5.00E+02 METERS       PLUME DEPTH: 4.605E+02 M.                                 KI FACTOR: 4.98E-01
AERO CONC. IN MICRO-G/M**3

                              PLUME      PLUME-                                        CELLS
 SPECIES        AMBIENT       AVE.        AMB      ---------------------------------------------------------------------------------------------------
                                                       1          2          3          4          5          6          7          8          9          10
 1 TRAC  (D) 0.             1.48E-01   1.448E-01   7.10E-02   1.48E-01   1.96E-01   2.26E-01   2.40E-01   2.40E-01   2.26E-01   1.96E-01   1.48E-01   7.10E-02
 2 DIST  (D) 1.00E+00       1.00E+00  -2.274E-13   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00   1.00E+00
 3 NO2   (D) 1.01E-02       4.45E-02   3.430E-02   2.88E-02   4.59E-02   5.56E-02   6.12E-02   6.39E-02   6.39E-02   6.12E-02   5.56E-02   4.59E-02   2.88E-02
 4 NO    (D) 3.65E-03       9.14E-02   8.780E-02   4.49E-02   9.31E-02   1.24E-01   1.43E-01   1.52E-01   1.52E-01   1.43E-01   1.24E-01   9.31E-02   4.49E-02
 5 O3    (D) 5.45E-02       3.45E-02  -1.998E-02   4.29E-02   3.34E-02   2.85E-02   2.58E-02   2.46E-02   2.46E-02   2.58E-02   2.85E-02   3.34E-02   4.29E-02
 6 HNO2  (D) 0.             1.97E-06   1.973E-06   3.38E-06   1.43E-06   9.30E-07   7.40E-07   6.73E-07   6.73E-07   7.40E-07   9.30E-07   1.43E-06   3.38E-06
 7 CO    (D) 6.00E-01       6.00E-01  -2.341E-05   6.00E-01   6.00E-01   6.00E-01   6.00E-01   6.00E-01   6.00E-01   6.00E-01   6.00E-01   6.00E-01   6.00E-01
 8 PAN   (D) 9.84E-05       6.01E-05  -3.828E-05   7.11E-05   5.82E-05   5.22E-05   4.91E-05   4.77E-05   4.77E-05   4.91E-05   5.22E-05   5.82E-05   7.11E-05
 9 OLE   (D) 1.08E-02       1.08E-02   4.662E-05   1.08E-02   1.09E-02   1.09E-02   1.09E-02   1.09E-02   1.09E-02   1.09E-02   1.09E-02   1.09E-02   1.08E-02
10 CARB  (D) 3.01E-02       2.95E-02  -6.264E-04   2.97E-02   2.95E-02   2.94E-02   2.93E-02   2.93E-02   2.93E-02   2.93E-02   2.94E-02   2.95E-02   2.97E-02
11 PAR   (D) 3.31E-01       3.31E-01  -3.237E-04   3.31E-01   3.31E-01   3.31E-01   3.31E-01   3.31E-01   3.31E-01   3.31E-01   3.31E-01   3.31E-01   3.31E-01
12 ARO   (D) 1.39E-01       1.39E-01   2.807E-04   1.39E-01   1.39E-01   1.39E-01   1.39E-01   1.39E-01   1.39E-01   1.39E-01   1.39E-01   1.39E-01   1.39E-01
13 SO2   (D) 2.00E-02       2.56E-01   2.356E-01   1.55E-01   2.62E-01   3.39E-01   3.87E-01   4.10E-01   4.10E-01   3.87E-01   3.39E-01   2.62E-01   1.55E-01
14 HSO3  (D) 0.             3.26E-07   3.262E-07   4.78E-07   2.91E-07   2.12E-07   1.79E-07   1.66E-07   1.66E-07   1.79E-07   2.12E-07   2.91E-07   4.78E-07
15 HSO4  (D) 0.             2.36E-08   2.358E-08   3.87E-08   2.38E-08   1.96E-08   1.77E-08   1.69E-08   1.69E-08   1.77E-08   1.96E-08   2.38E-08   3.87E-08
16 ETH   (D) 1.09E-02       1.10E-02   1.237E-05   1.10E-02   1.10E-02   1.10E-02   1.10E-02   1.10E-02   1.10E-02   1.10E-02   1.10E-02   1.10E-02   1.10E-02
17 HZA   (D) 1.64E-04       1.48E-04  -1.662E-05   1.58E-04   1.48E-04   1.41E-04   1.37E-04   1.35E-04   1.35E-04   1.37E-04   1.41E-04   1.48E-04   1.58E-04
18 O     (S) 0.             4.07E-09   4.066E-09   2.78E-09   4.21E-09   4.98E-09   5.42E-09   5.62E-09   5.62E-09   5.42E-09   4.98E-09   4.21E-09   2.78E-09
19 CRIC  (S) 0.             2.30E-09   2.303E-09   3.27E-09   2.08E-09   1.60E-09   1.36E-09   1.26E-09   1.26E-09   1.36E-09   1.60E-09   2.08E-09   3.27E-09
20 MCRC  (S) 0.             1.77E-09   1.768E-09   2.51E-09   1.60E-09   1.22E-09   1.04E-09   9.63E-10   9.63E-10   1.04E-09   1.22E-09   1.60E-09   2.51E-09
21 OH    (S) 0.             1.25E-07   1.250E-07   1.50E-07   1.25E-07   1.06E-07   9.73E-08   9.41E-08   9.41E-08   9.73E-08   1.06E-07   1.25E-07   1.50E-07
22 RAO2  (S) 0.             1.70E-07   1.699E-07   2.93E-07   1.23E-07   7.86E-08   6.20E-08   5.62E-08   5.62E-08   6.20E-08   7.86E-08   1.23E-07   2.93E-07
23 RBO2  (S) 0.             5.03E-08   5.032E-08   8.78E-08   3.60E-08   2.29E-08   1.80E-08   1.63E-08   1.63E-08   1.80E-08   2.29E-08   3.60E-08   8.78E-08
24 MEO2  (S) 0.             4.94E-07   4.938E-07   8.37E-07   3.62E-07   2.40E-07   1.94E-07   1.77E-07   1.77E-07   1.94E-07   2.40E-07   3.62E-07   8.37E-07
25 ACO3  (S) 0.             2.20E-07   2.202E-07   3.67E-07   1.68E-07   1.11E-07   8.90E-08   8.12E-08   8.12E-08   8.90E-08   1.11E-07   1.68E-07   3.67E-07
26 ROR   (S) 0.             6.45E-08   6.434E-08   9.46E-08   5.63E-08   4.26E-08   3.61E-08   3.34E-08   3.34E-08   3.61E-08   4.26E-08   5.63E-08   9.46E-08
27 Y     (S) 0.             4.76E-04   4.764E-04   7.41E-04   4.02E-04   2.79E-04   2.28E-04   2.09E-04   2.09E-04   2.28E-04   2.79E-04   4.02E-04   7.41E-04
28 X     (S) 0.             4.14E-09   4.139E-09   4.79E-09   4.14E-09   3.65E-09   3.41E-09   3.32E-09   3.32E-09   3.41E-09   3.65E-09   4.14E-09   4.79E-09
29 W     (S) 0.             1.77E-08   1.766E-08   2.10E-08   1.77E-08   1.51E-08   1.39E-08   1.34E-08   1.34E-08   1.39E-08   1.51E-08   1.77E-08   2.10E-08
30 HNO3  (U) 0.             5.14E-05   5.140E-05   3.60E-05   5.49E-05   6.21E-05   6.55E-05   6.71E-05   6.71E-05   6.55E-05   6.21E-05   5.49E-05   3.60E-05
31 CO2   (U) 0.             5.19E-05   5.186E-05   4.32E-05   5.51E-05   5.64E-05   5.95E-05   5.99E-05   5.99E-05   5.95E-05   5.64E-05   5.51E-05   4.32E-05
32 O2    (U) 0.             3.14E-02   3.145E-02   1.84E-02   3.30E-02   4.07E-02   4.51E-02   4.71E-02   4.71E-02   4.51E-02   4.07E-02   3.30E-02   1.84E-02
33 AERS  (U) 0.             2.74E-02   2.737E-02   1.90E-02   2.92E-02   3.35E-02   3.56E-02   3.66E-02   3.66E-02   3.56E-02   3.35E-02   2.92E-02   1.90E-02
34 AERO  (D) 0.             9.99E-06   9.989E-06   9.78E-06   1.02E-05   1.01E-05   1.01E-05   1.00E-05   1.00E-05   1.01E-05   1.01E-05   1.02E-05   9.78E-06
35 H2O   (I) 0.             1.90E+04   1.900E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04   1.90E+04

                                                                                  CELLS
                                  -----------------------------------------------------------------------------------------------
                                       1          2          3          4          5          6          7          8          9          10
      CELL DEPTHS (M)              4.61E+02   4.61E+02   4.61E+02   4.61E+02   4.61E+02   4.61E+02   4.61E+02   4.61E+02   4.61E+02   4.61E+02
      CELL WIDTHS (M)              1.45E+01   6.94E+00   5.23E+00   4.56E+00   4.29E+00   4.29E+00   4.56E+00   5.23E+00   6.94E+00   1.45E+01
CELL CENTERLINES (M)              -2.83E+01  -1.76E+01  -1.15E+01  -6.58E+00  -2.15E+00   2.15E+00   6.58E+00   1.15E+01   1.76E+01   2.83E+01

 CELL BOUNDARIES (M)  -3.55E+01  -2.10E+01  -1.41E+01  -8.86E+00  -4.29E+00   0.              4.29E+00   8.86E+00   1.41E+01   2.10E+01   3.55E+01
DIFFUSIVITIES (M2/S)   0.                    1.52E+00   1.97E+00   2.12E+00   2.22E+00   0.              2.22E+00   2.12E+00   1.97E+00   1.52E+00   0.
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Figure 15 (Continued).

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 TIME= 1.00E+01 MIN.          PLUME WIDTH= 3.322E+02 M.     SIGMA Y= 8.306E+01 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 2.40E+03 METERS        PLUME DEPTH= 1.219E+03 M.                                 KI FACTOR= 4.87E-01
AERS CONC. IN MICRO-G/M**3

                                                                                        CELLS
                           PLUME      PLUME-    ---------------------------------------------------------------------------------------------------------
 SPECIES         AMBIENT    AVE.        AMB         1         2         3         4         5         6         7         8         9        10
 1 TRAC (D) 0.           1.14E-02  1.138E-02  8.88E-03 1.17E-02 1.54E-02 1.77E-02 1.88E-02 1.88E-02 1.77E-02 1.54E-02 1.17E-02 8.88E-03
 2 TEST (D) 1.00E+00 1.00E+00 -7.816E-14  1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2  (D) 1.06E-02 1.78E-02  7.229E-03  1.42E-02 1.81E-02 2.03E-02 2.17E-02 2.24E-02 2.24E-02 2.17E-02 2.03E-02 1.81E-02 1.42E-02
 4 NO   (D) 2.00E-03 4.10E-03  2.094E-03  2.09E-03 4.00E-03 4.92E-03 5.46E-03 5.74E-03 5.74E-03 5.46E-03 4.92E-03 4.00E-03 2.09E-03
 5 O3   (D) 6.33E-02 6.18E-02 -1.506E-03  6.40E-02 6.18E-02 6.02E-02 5.92E-02 5.87E-02 5.87E-02 5.92E-02 6.02E-02 6.18E-02 6.40E-02
 6 HNO2 (D) 0.           3.75E-05  3.749E-05  4.67E-05 3.69E-05 3.00E-05 2.76E-05 2.60E-05 2.60E-05 2.76E-05 3.00E-05 3.69E-05 4.67E-05
 7 CO   (D) 6.01E-01 6.01E-01  5.300E-05  6.01E-01 6.01E-01 6.01E-01 6.01E-01 6.01E-01 6.01E-01 6.01E-01 6.01E-01 6.01E-01 6.01E-01
 8 FAR  (D) 5.60E-04 5.72E-04  1.128E-05  5.89E-04 5.77E-04 5.61E-04 5.49E-04 5.43E-04 5.43E-04 5.49E-04 5.61E-04 5.77E-04 5.89E-04
 9 OLE  (D) 9.86E-03 9.81E-03 -5.035E-05  9.80E-03 9.80E-03 9.81E-03 9.82E-03 9.82E-03 9.82E-03 9.82E-03 9.81E-03 9.80E-03 9.80E-03
10 CARB (D) 4.07E-02 4.04E-02 -3.354E-04  4.03E-02 4.04E-02 4.04E-02 4.04E-02 4.04E-02 4.04E-02 4.04E-02 4.04E-02 4.04E-02 4.03E-02
11 PAR  (D) 3.36E-01 3.35E-01 -7.859E-04  3.35E-01 3.35E-01 3.35E-01 3.35E-01 3.35E-01 3.35E-01 3.35E-01 3.35E-01 3.35E-01 3.35E-01
12 ARO  (D) 1.33E-01 1.32E-01 -6.201E-04  1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01 1.32E-01
13 SO2  (D) 1.99E-02 3.63E-02  1.644E-02  2.09E-02 3.38E-02 4.49E-02 4.96E-02 5.04E-02 5.04E-02 4.96E-02 4.49E-02 3.38E-02 2.09E-02
14 N2O5 (D) 0.           7.71E-06  7.712E-06  7.84E-06 8.21E-06 8.02E-06 7.81E-06 7.66E-06 7.66E-06 7.81E-06 8.02E-06 8.21E-06 7.84E-06
15 HNO4 (D) 0.           1.40E-07  1.397E-07  1.19E-07 1.48E-07 1.55E-07 1.57E-07 1.57E-07 1.57E-07 1.57E-07 1.55E-07 1.48E-07 1.19E-07
16 ETH  (D) 1.07E-02 1.07E-02 -1.778E-05  1.07E-02 1.07E-02 1.07E-02 1.07E-02 1.07E-02 1.07E-02 1.07E-02 1.07E-02 1.07E-02 1.07E-02
17 BZA  (D) 9.43E-04 9.83E-04  3.992E-05  9.79E-04 9.93E-04 9.88E-04 9.80E-04 9.76E-04 9.76E-04 9.80E-04 9.88E-04 9.93E-04 9.79E-04
18 O    (S) 0.           1.97E-09  1.974E-09  1.58E-09 2.00E-09 2.28E-09 2.41E-09 2.48E-09 2.48E-09 2.41E-09 2.28E-09 2.00E-09 1.58E-09
19 CRIC (S) 0.           5.06E-09  5.058E-09  5.41E-09 5.04E-09 4.81E-09 4.67E-09 4.60E-09 4.60E-09 4.67E-09 4.81E-09 5.04E-09 5.41E-09
20 MCRG (S) 0.           3.81E-09  3.815E-09  4.08E-09 3.80E-09 3.63E-09 3.52E-09 3.47E-09 3.47E-09 3.52E-09 3.63E-09 3.80E-09 4.08E-09
21 OH   (S) 0.           3.48E-07  3.484E-07  3.22E-07 3.63E-07 3.61E-07 3.58E-07 3.53E-07 3.53E-07 3.58E-07 3.61E-07 3.63E-07 3.22E-07
22 RAO2 (S) 0.           2.42E-06  2.417E-06  2.87E-06 2.43E-06 2.09E-06 1.90E-06 1.80E-06 1.80E-06 1.90E-06 2.09E-06 2.43E-06 2.87E-06
23 RBO2 (S) 0.           9.59E-07  9.589E-07  1.21E-06 9.40E-07 7.76E-07 6.93E-07 6.52E-07 6.52E-07 6.93E-07 7.76E-07 9.40E-07 1.21E-06
24 MEO2 (S) 0.           1.02E-05  1.023E-05  1.29E-05 9.92E-06 8.26E-06 7.41E-06 7.01E-06 7.01E-06 7.41E-06 8.26E-06 9.92E-06 1.29E-05
25 ACO3 (S) 0.           3.02E-06  3.022E-06  3.62E-06 3.00E-06 2.59E-06 2.37E-06 2.26E-06 2.26E-06 2.37E-06 2.59E-06 3.00E-06 3.62E-06
26 HO2  (S) 0.           1.27E-07  1.267E-07  1.04E-07 1.27E-07 1.43E-07 1.52E-07 1.57E-07 1.57E-07 1.52E-07 1.43E-07 1.27E-07 1.04E-07
27 Y    (S) 0.           8.07E-03  8.070E-03  1.00E-02 9.06E-03 8.06E-03 7.49E-03 7.17E-03 7.17E-03 7.49E-03 8.06E-03 9.06E-03 1.00E-02
28 X    (S) 0.           1.17E-08  1.171E-08  1.12E-08 1.21E-08 1.21E-08 1.20E-08 1.19E-08 1.19E-08 1.20E-08 1.21E-08 1.21E-08 1.12E-08
29 Z    (S) 0.           3.42E-08  3.423E-08  3.27E-08 3.56E-08 3.54E-08 3.52E-08 3.47E-08 3.47E-08 3.52E-08 3.54E-08 3.56E-08 3.27E-08
30 HNO3 (U) 0.           4.69E-04  4.693E-04  2.97E-04 4.92E-04 5.91E-04 6.47E-04 6.72E-04 6.72E-04 6.47E-04 5.91E-04 4.92E-04 2.97E-04
31 CO2  (U) 0.           4.98E-04  4.983E-04  3.82E-04 5.29E-04 5.84E-04 6.09E-04 6.19E-04 6.19E-04 6.09E-04 5.84E-04 5.29E-04 3.82E-04
32 O2   (U) 0.           4.47E-02  4.472E-02  2.87E-02 4.62E-02 5.81E-02 6.52E-02 6.86E-02 6.86E-02 6.52E-02 5.81E-02 4.62E-02 2.87E-02
33 AERS (U) 0.           3.90E-01  3.897E-01  2.30E-01 4.07E-01 5.03E-01 5.59E-01 5.84E-01 5.84E-01 5.59E-01 5.03E-01 4.07E-01 2.30E-01
34 AERO (U) 0.           7.69E-04  7.693E-04  7.70E-04 8.23E-04 7.77E-04 7.33E-04 7.09E-04 7.09E-04 7.33E-04 7.77E-04 8.23E-04 7.70E-04
35 H2O  (I) 0.           1.90E+04  1.900E+04  1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                           CELLS
                                ----------------------------------------------------------------------------------------------------
                                     1          2          3          4          5          6          7          8          9         10
      CELL DEPTHS (M)            1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03
       CELL WIDTHS (M)           6.76E+01   3.24E+01   2.45E+01   2.13E+01   2.01E+01   2.01E+01   2.13E+01   2.45E+01   3.24E+01   6.76E+01
CELL CENTERLINES (M)            -1.32E+02  -8.21E+01  -5.37E+01  -3.07E+01  -1.00E+01   1.00E+01   3.07E+01   5.37E+01   8.21E+01   1.32E+02

 CELL BOUNDARIES (M)   -1.66E+02 -9.83E+01 -6.59E+01 -4.14E+01 -2.01E+01  0.          2.01E+01  4.14E+01  6.59E+01  9.83E+01  1.66E+02
DIFFUSIVITIES (M2/S)    0.        7.10E+00  9.20E+00  9.93E+00  1.04E+01  0.          1.04E+01  9.93E+00  9.20E+00  7.10E+00  0.
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Figure 15 (Continued).

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                                   -----------------------------------------------------------------------------------------------------
 TIME: 3.00E+01 MIN           PLUME WIDTH: 6.312E+02 M.     SIGMA Y: 1.570E+02 M.     WIND SPEED: 4.00E+00 M/SEC
FETCH: 4.90E+03 METERS        PLUME DEPTH: 1.221E+03 M                                  KI FACTOR: 4.75E-01
AERS CONC. IN MICRO-G/M**3

                                                                                    CELLS
                              PLUME      PLUME-      ------------------------------------------------------------------------------------------------------
  SPECIES       AMBIENT        AVE.       AMB          1        2        3        4        5        6        7        8        9        10
  1 TRAC  (D)  0.          8.97E-03   8.969E-03    2.93E-03 6.12E-03 8.08E-03 9.30E-03 9.88E-03 9.88E-03 9.30E-03 8.08E-03 6.12E-03 2.93E-03
  2 TEST  (D)  1.00E+00    1.00E+00  -4.395E-14    1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
  3 NO2   (D)  9.60E-03    1.31E-02   3.521E-03    1.13E-02 1.32E-02 1.44E-02 1.51E-02 1.55E-02 1.55E-02 1.51E-02 1.44E-02 1.32E-02 1.13E-02
  4 NO    (D)  1.19E-03    1.79E-03   6.007E-04    1.34E-03 1.80E-03 1.96E-03 2.06E-03 2.11E-03 2.11E-03 2.06E-03 1.96E-03 1.80E-03 1.34E-03
  5 O3    (D)  7.75E-02    8.26E-02   5.118E-03    8.07E-02 8.28E-02 8.40E-02 8.46E-02 8.49E-02 8.49E-02 8.46E-02 8.40E-02 8.28E-02 8.07E-02
  6 BNC   (D)  0.          7.50E-05   7.576E-05    7.79E-05 7.64E-05 7.38E-05 7.32E-05 7.26E-05 7.26E-05 7.32E-05 7.38E-05 7.64E-05 7.79E-05
  7 CO    (D)  6.02E-01    6.02E-01   1.705E-04    6.02E-01 6.02E-01 6.02E-01 6.02E-01 6.02E-01 6.02E-01 6.02E-01 6.02E-01 6.02E-01 6.02E-01
  8 FAR   (D)  1.40E-03    1.64E-03   2.370E-04    1.53E-03 1.65E-03 1.72E-03 1.76E-03 1.78E-03 1.78E-03 1.76E-03 1.72E-03 1.65E-03 1.53E-03
  9 OLE   (D)  8.73E-03    8.44E-03  -2.855E-04    8.57E-03 8.43E-03 8.36E-03 8.31E-03 8.29E-03 8.29E-03 8.31E-03 8.36E-03 8.43E-03 8.57E-03
 10 CARB  (D)  5.29E-02    5.43E-02   1.404E-03    5.31E-02 5.43E-02 5.51E-02 5.57E-02 5.59E-02 5.59E-02 5.57E-02 5.51E-02 5.43E-02 5.31E-02
 11 PAR   (D)  3.40E-01    3.39E-01  -8.118E-04    3.39E-01 3.39E-01 3.39E-01 3.39E-01 3.39E-01 3.39E-01 3.39E-01 3.39E-01 3.39E-01 3.39E-01
 12 ARO   (D)  1.23E-01    1.23E-01  -2.218E-03    1.24E-01 1.23E-01 1.22E-01 1.22E-01 1.22E-01 1.22E-01 1.22E-01 1.22E-01 1.23E-01 1.24E-01
 13 RO2   (D)  1.98E-02    2.94E-02   9.571E-03    2.45E-02 2.96E-02 3.28E-02 3.47E-02 3.56E-02 3.56E-02 3.47E-02 3.28E-02 2.96E-02 2.45E-02
 14 HNO3  (D)  0.          1.31E-05   1.315E-05    1.09E-05 1.36E-05 1.47E-05 1.54E-05 1.57E-05 1.57E-05 1.54E-05 1.47E-05 1.36E-05 1.09E-05
 15 HNO4  (D)  0.          1.43E-07   1.431E-07    1.19E-07 1.47E-07 1.60E-07 1.67E-07 1.71E-07 1.71E-07 1.67E-07 1.60E-07 1.47E-07 1.19E-07
 16 ETH   (D)  1.03E-02    1.02E-02  -9.785E-05    1.03E-02 1.02E-02 1.02E-02 1.02E-02 1.02E-02 1.02E-02 1.02E-02 1.02E-02 1.02E-02 1.03E-02
 17 BZA   (D)  1.33E-03    1.60E-03   2.492E-04    1.49E-03 1.61E-03 1.68E-03 1.72E-03 1.74E-03 1.74E-03 1.72E-03 1.68E-03 1.61E-03 1.49E-03
 18 O     (S)  0.          1.42E-09   1.416E-09    1.22E-09 1.43E-09 1.55E-09 1.64E-09 1.67E-09 1.67E-09 1.64E-09 1.55E-09 1.43E-09 1.22E-09
 19 CRIG  (S)  0.          6.16E-09   6.158E-09    6.19E-09 6.16E-09 6.14E-09 6.12E-09 6.11E-09 6.11E-09 6.12E-09 6.14E-09 6.16E-09 6.19E-09
 20 MCRG  (S)  0.          4.52E-09   4.517E-09    4.55E-09 4.52E-09 4.49E-09 4.47E-09 4.47E-09 4.47E-09 4.47E-09 4.49E-09 4.52E-09 4.55E-09
 21 OH    (S)  0.          3.34E-07   3.343E-07    3.00E-07 3.40E-07 3.56E-07 3.71E-07 3.76E-07 3.76E-07 3.71E-07 3.56E-07 3.40E-07 3.00E-07
 22 RAO2  (S)  0.          3.12E-06   3.119E-06    3.18E-06 3.16E-06 3.09E-06 3.10E-06 3.08E-06 3.08E-06 3.10E-06 3.09E-06 3.16E-06 3.18E-06
 23 RBO2  (S)  0.          1.88E-06   1.883E-06    1.96E-06 1.90E-06 1.81E-06 1.79E-06 1.77E-06 1.77E-06 1.79E-06 1.81E-06 1.90E-06 1.96E-06
 24 MEO2  (S)  0.          2.51E-03   2.510E-03    2.64E-03 2.51E-03 2.41E-03 2.37E-03 2.34E-03 2.34E-03 2.37E-03 2.41E-03 2.51E-03 2.64E-03
 25 ACO3  (S)  0.          6.50E-06   6.501E-06    6.76E-06 6.60E-06 6.42E-06 6.39E-06 6.34E-06 6.34E-06 6.39E-06 6.42E-06 6.60E-06 6.76E-06
 26 NO3   (S)  0.          9.13E-08   9.126E-08    7.08E-08 9.10E-08 1.00E-07 1.05E-07 1.05E-07 1.05E-07 1.05E-07 1.00E-07 9.10E-08 7.08E-08
 27 Y     (S)  0.          1.52E-02   1.520E-02    1.49E-02 1.54E-02 1.53E-02 1.54E-02 1.54E-02 1.54E-02 1.54E-02 1.53E-02 1.54E-02 1.49E-02
 28 X     (S)  0.          1.34E-08   1.335E-08    1.20E-08 1.35E-08 1.42E-08 1.48E-08 1.50E-08 1.50E-08 1.48E-08 1.42E-08 1.35E-08 1.20E-08
 29 W     (S)  0.          2.26E-08   2.264E-08    2.10E-08 2.31E-08 2.37E-08 2.43E-08 2.45E-08 2.45E-08 2.43E-08 2.37E-08 2.31E-08 2.10E-08
 30 ENO3  (U)  0.          1.02E-03   1.023E-03    6.12E-04 1.06E-03 1.31E-03 1.46E-03 1.53E-03 1.53E-03 1.46E-03 1.31E-03 1.06E-03 6.12E-04
 31 CO2   (U)  0.          1.37E-03   1.371E-03    9.43E-04 1.43E-03 1.67E-03 1.81E-03 1.87E-03 1.87E-03 1.81E-03 1.67E-03 1.43E-03 9.43E-04
 32 O2    (U)  0.          5.85E-02   5.848E-02    3.53E-02 6.06E-02 7.48E-02 8.32E-02 8.72E-02 8.72E-02 8.32E-02 7.48E-02 6.06E-02 3.53E-02
 33 AERS  (U)  0.          8.21E-01   8.206E-01    4.74E-01 8.49E-01 1.06E+00 1.19E+00 1.25E+00 1.25E+00 1.19E+00 1.06E+00 8.49E-01 4.74E-01
 34 AERO  (U)  0.          5.14E-03   5.137E-03    4.07E-03 5.42E-03 5.92E-03 6.15E-03 6.25E-03 6.25E-03 6.15E-03 5.92E-03 5.42E-03 4.07E-03
 35 H2O   (I)  0.          1.90E+04   1.900E+04    1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                     CELLS
                               ---------------------------------------------------------------------------------------------------------
                                  1          2          3          4          5          6          7          8          9         10
      CELL DEPTHS (M)          1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03
      CELL WIDTHS (M)          1.29E+02   6.16E+01   4.66E+01   4.05E+01   3.81E+01   3.81E+01   4.05E+01   4.66E+01   6.16E+01   1.29E+02
 CELL CENTERLINES (M)         -2.51E+02  -1.56E+02  -1.02E+02  -5.84E+01  -1.91E+01   1.91E+01   5.84E+01   1.02E+02   1.56E+02   2.51E+02

  CELL BOUNDARIES (M)   -3.16E+02 -1.87E+02 -1.25E+02 -7.86E+01 -3.81E+01  0.         3.81E+01  7.86E+01  1.25E+02  1.87E+02  3.16E+02
DIFFUSIVITIES (M2/S)    0.         1.19E+01  1.84E+01  1.66E+01  1.73E+01  0.         1.73E+01  1.66E+01  1.84E+01  1.19E+01  0.
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Figure 15 (Continued).

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 TIME  3.00E+01 MIN            PLUME WIDTH= 9.070E+02 M.     SIGMA Y= 2.266E+02 M       WIND SPEED= 4.00E+00 M/SEC
FETCH  7.20E+03 METERS         PLUME DEPTH= 1.224E+03 M.                                  KI FACTOR= 4.62E-01
AERO CONC. IN MICRO-G/M**3

                                                                                          CELLS
                          PLUME     PLUME-   ---------------------------------------------------------------------------------------------------
 SPECIES      AMBIENT     AVE.       AMB         1        2        3        4        5        6        7        8        9        10
 1 TRAC  (D) 0.          4.19E-03  4.189E-03  2.05E-03 4.29E-03 5.67E-03 6.82E-03 6.94E-03 6.94E-03 6.82E-03 5.67E-03 4.29E-03 2.05E-03
 2 TEST  (D) 1.00E+00  1.00E+00 -6.395E-14  1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2   (D) 8.00E-03  1.01E-02  2.139E-03  9.06E-03 1.02E-02 1.09E-02 1.13E-02 1.18E-02 1.18E-02 1.13E-02 1.09E-02 1.02E-02 9.06E-03
 4 NO    (D) 9.64E-04  1.20E-03  2.321E-04  1.09E-03 1.20E-03 1.27E-03 1.31E-03 1.33E-03 1.33E-03 1.31E-03 1.27E-03 1.20E-03 1.09E-03
 5 O3    (D) 8.63E-02  9.37E-02  7.433E-03  9.05E-02 9.40E-02 9.60E-02 9.72E-02 9.78E-02 9.78E-02 9.72E-02 9.60E-02 9.40E-02 9.05E-02
 6 HO2   (D) 0.        8.52E-05  8.518E-05  8.90E-05 8.36E-05 8.33E-05 8.31E-05 8.30E-05 8.30E-05 8.31E-05 8.33E-05 8.36E-05 8.90E-05
 7 CO    (D) 6.04E-01  6.04E-01  3.017E-04  6.04E-01 6.04E-01 6.04E-01 6.04E-01 6.04E-01 6.04E-01 6.04E-01 6.04E-01 6.04E-01 6.04E-01
 8 FAR   (D) 2.32E-03  2.69E-03  3.709E-04  2.50E-03 2.70E-03 2.83E-03 2.91E-03 2.95E-03 2.95E-03 2.91E-03 2.83E-03 2.70E-03 2.50E-03
 9 OLE   (D) 7.80E-03  7.49E-03 -3.043E-04  7.64E-03 7.48E-03 7.38E-03 7.33E-03 7.30E-03 7.30E-03 7.33E-03 7.38E-03 7.48E-03 7.64E-03
10 CARB  (D) 6.24E-02  6.36E-02  1.203E-03  6.23E-02 6.36E-02 6.45E-02 6.51E-02 6.54E-02 6.54E-02 6.51E-02 6.45E-02 6.36E-02 6.23E-02
11 PAR   (D) 3.41E-01  3.40E-01 -1.529E-03  3.40E-01 3.40E-01 3.40E-01 3.40E-01 3.40E-01 3.40E-01 3.40E-01 3.40E-01 3.40E-01 3.40E-01
12 ARO   (D) 1.18E-01  1.16E-01 -2.497E-03  1.17E-01 1.16E-01 1.15E-01 1.15E-01 1.14E-01 1.14E-01 1.15E-01 1.15E-01 1.16E-01 1.17E-01
13 SO2   (D) 1.97E-02  2.64E-02  6.663E-03  2.30E-02 2.65E-02 2.87E-02 3.01E-02 3.07E-02 3.07E-02 3.01E-02 2.87E-02 2.65E-02 2.30E-02
14 N2O5  (D) 0.        1.34E-05  1.342E-05  1.13E-05 1.30E-05 1.49E-05 1.56E-05 1.59E-05 1.59E-05 1.56E-05 1.49E-05 1.30E-05 1.13E-05
15 HSO4  (D) 0.        1.27E-07  1.265E-07  1.09E-07 1.30E-07 1.39E-07 1.45E-07 1.47E-07 1.47E-07 1.45E-07 1.39E-07 1.30E-07 1.09E-07
16 ETH   (D) 1.00E-02  9.89E-03 -1.149E-04  9.96E-03 9.90E-03 9.86E-03 9.84E-03 9.83E-03 9.83E-03 9.84E-03 9.86E-03 9.90E-03 9.96E-03
17 BZA   (D) 1.33E-03  1.53E-03  1.964E-04  1.43E-03 1.54E-03 1.60E-03 1.64E-03 1.65E-03 1.65E-03 1.64E-03 1.60E-03 1.54E-03 1.43E-03
18 O     (S) 0.        1.06E-09  1.063E-09  9.82E-10 1.07E-09 1.14E-09 1.19E-09 1.21E-09 1.21E-09 1.19E-09 1.14E-09 1.07E-09 9.82E-10
19 CRIG  (S) 0.        6.41E-09  6.413E-09  6.36E-09 6.43E-09 6.45E-09 6.46E-09 6.47E-09 6.47E-09 6.46E-09 6.45E-09 6.43E-09 6.36E-09
20 MCRG  (S) 0.        4.59E-09  4.592E-09  4.57E-09 4.60E-09 4.61E-09 4.61E-09 4.61E-09 4.61E-09 4.61E-09 4.61E-09 4.60E-09 4.57E-09
21 OH    (S) 0.        2.51E-07  2.510E-07  2.30E-07 2.54E-07 2.66E-07 2.73E-07 2.77E-07 2.77E-07 2.73E-07 2.66E-07 2.54E-07 2.30E-07
22 RAO2  (S) 0.        2.38E-06  2.383E-06  2.37E-06 2.40E-06 2.39E-06 2.39E-06 2.39E-06 2.39E-06 2.39E-06 2.39E-06 2.40E-06 2.37E-06
23 RNO2  (S) 0.        2.01E-06  2.014E-06  2.03E-06 2.03E-06 2.00E-06 1.99E-06 1.98E-06 1.98E-06 1.99E-06 2.00E-06 2.03E-06 2.03E-06
24 MEO2  (S) 0.        3.15E-05  3.154E-05  3.19E-05 3.16E-05 3.12E-05 3.11E-05 3.10E-05 3.10E-05 3.11E-05 3.12E-05 3.16E-05 3.19E-05
25 ACO3  (S) 0.        9.05E-06  9.053E-06  9.13E-06 9.06E-06 9.00E-06 8.97E-06 8.95E-06 8.95E-06 8.97E-06 9.00E-06 9.06E-06 9.13E-06
26 ROR   (S) 0.        8.89E-08  8.888E-08  7.09E-08 8.89E-08 9.58E-08 1.00E-07 1.02E-07 1.02E-07 1.00E-07 9.58E-08 8.89E-08 7.09E-08
27 T     (S) 0.        1.40E-02  1.400E-02  1.37E-02 1.41E-02 1.42E-02 1.43E-02 1.43E-02 1.43E-02 1.43E-02 1.42E-02 1.41E-02 1.37E-02
28 X     (S) 0.        1.14E-08  1.143E-08  1.05E-08 1.15E-08 1.21E-08 1.24E-08 1.26E-08 1.26E-08 1.24E-08 1.21E-08 1.15E-08 1.05E-08
29 Y     (S) 0.        1.37E-08  1.371E-08  1.30E-08 1.39E-08 1.42E-08 1.44E-08 1.45E-08 1.45E-08 1.44E-08 1.42E-08 1.39E-08 1.30E-08
30 HNO3  (U) 0.        1.24E-03  1.244E-03  7.40E-04 1.29E-03 1.60E-03 1.70E-03 1.87E-03 1.87E-03 1.70E-03 1.60E-03 1.29E-03 7.40E-04
31 CO2   (U) 0.        1.98E-03  1.978E-03  1.33E-03 2.07E-03 2.44E-03 2.65E-03 2.74E-03 2.74E-03 2.65E-03 2.44E-03 2.07E-03 1.33E-03
32 O2    (U) 0.        6.79E-02  6.785E-02  4.19E-02 7.05E-02 8.61E-02 9.53E-02 9.96E-02 9.96E-02 9.53E-02 8.61E-02 7.05E-02 4.19E-02
33 AERS  (U) 0.        1.04E+00  1.038E+00  6.05E-01 1.08E+00 1.34E+00 1.50E+00 1.58E+00 1.58E+00 1.50E+00 1.34E+00 1.08E+00 6.05E-01
34 AERO  (U) 0.        1.04E-02  1.038E-02  7.65E-03 1.09E-02 1.24E-02 1.31E-02 1.35E-02 1.35E-02 1.31E-02 1.24E-02 1.09E-02 7.65E-03
35 H2O   (I) 0.        1.90E+04  1.900E+04  1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                    CELLS
                        -------------------------------------------------------------------------------------------------------
                              1          2          3          4          5          6          7          8          9          10
      CELL DEPTHS (M)      1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03   1.22E+03
      CELL WIDTHS (M)      1.85E+02   8.85E+01   6.70E+01   5.82E+01   5.48E+01   5.48E+01   5.82E+01   6.70E+01   8.85E+01   1.85E+02
 CELL CENTERLINES (M)     -3.61E+02  -2.24E+02  -1.47E+02  -8.39E+01  -2.74E+01   2.74E+01   8.39E+01   1.47E+02   2.24E+02   3.61E+02

  CELL BOUNDARIES (M)  -4.54E+02 -2.68E+02 -1.80E+02 -1.13E+02 -5.48E+01  0.          5.48E+01   1.13E+02   1.80E+02   2.68E+02   4.54E+02
 DIFFUSIVITIES (M2/S)   0.         1.71E+01  2.21E+01  2.39E+01  2.49E+01  0.          2.49E+01   2.39E+01   2.21E+01   1.71E+01   0.
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Figure 15 (Continued).

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TIME= 4.00E+01 MIN              PLUME WIDTH= 1.17E+03 M.     SIGMA Y= 2.933E+02 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 9.70E+03 METERS          PLUME DEPTH= 1.227E+03 M.                               KI FACTOR= 4.50E-01
AERS CONC. IN MICRO-G/M**3

                                PLUME      PLUME-                                                   CELLS
 SPECIES          AMBIENT       AVE.        AMB      -----------------------------------------------------------------------------------------------------------
                                                          1         2         3         4         5         6         7         8         9        10
  1 TRAC     (D)  0.           3.28E-03   3.284E-03   1.61E-03  3.37E-03  4.48E-03  5.12E-03  5.44E-03  5.44E-03  5.12E-03  4.45E-03  3.37E-03  1.61E-03
  2 TEST     (D)  1.00E+00     1.00E+00  -5.684E-14   1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
  3 NO2      (D)  6.71E-03     8.11E-03   1.396E-03   7.41E-03  8.18E-03  8.89E-03  8.87E-03  9.00E-03  9.00E-03  8.87E-03  8.89E-03  8.18E-03  7.41E-03
  4 [illegible] 7.5[illegible] [illegible] 1.[illegible]E-04   8.41E-04  9.[illegible]E-04  9.03E-04  9.4[illegible]  9.72E-04  9.72E-04  9.61E-04  9.3[illegible]E-04  9.01E-04  8.4[illegible]
  5 O3       (D)  9.15E-02     9.93E-02   8.022E-03   9.60E-02  9.98E-02  1.02E-01  1.03E-01  1.04E-01  1.04E-01  1.03E-01  1.02E-01  9.98E-02  9.60E-02
  6 NO3      (D)  0.           8.27E-05   8.266E-05   8.22E-05  8.29E-05  8.30E-05  8.31E-05  8.31E-05  8.31E-05  8.31E-05  8.30E-05  8.29E-05  8.22E-05
  7 CO       (D)  6.05E-01     6.06E-01   3.860E-04   6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01  6.06E-01
  8 PAR      (D)  3.10E-03     3.53E-03   4.280E-04   3.30E-03  3.54E-03  3.69E-03  3.78E-03  3.83E-03  3.83E-03  3.78E-03  3.69E-03  3.54E-03  3.30E-03
  9 OLE      (D)  7.10E-03     6.82E-03  -2.816E-04   6.97E-03  6.81E-03  6.72E-03  6.66E-03  6.63E-03  6.63E-03  6.66E-03  6.72E-03  6.81E-03  6.97E-03
 10 CARB     (D)  6.87E-02     6.96E-02   8.829E-04   6.88E-02  6.93E-02  7.03E-02  7.08E-02  7.11E-02  7.11E-02  7.08E-02  7.03E-02  6.95E-02  6.88E-02
 11 [illegible] 3.41E-01     3.40E-01  -1.713E-03   3.40E-01  3.39E-01  3.39E-01  3.39E-01  3.39E-01  3.39E-01  3.39E-01  3.39E-01  3.39E-01  3.4[illegible]
 12 ARO      (D)  1.14E-01     1.11E-01  -2.418E-03   1.12E-01  1.11E-01  1.10E-01  1.10E-01  1.10E-01  1.10E-01  1.10E-01  1.10E-01  1.11E-01  1.12E-01
 13 SO2      (D)  1.96E-02     2.48E-02   5.194E-03   2.22E-02  2.60E-02  2.67E-02  2.77E-02  2.82E-02  2.82E-02  2.77E-02  2.67E-02  2.60E-02  2.22E-02
 14 HSO3     (D)  0.           1.29E-05   1.288E-05   1.10E-05  1.32E-05  1.42E-05  1.48E-05  1.50E-05  1.50E-05  1.48E-05  1.42E-05  1.32E-05  1.10E-05
 15 HSO4     (D)  0.           1.14E-07   1.141E-07   1.00E-07  1.17E-07  1.24E-07  1.28E-07  1.30E-07  1.30E-07  1.28E-07  1.24E-07  1.17E-07  1.00E-07
 16 ETH      (D)  9.77E-03     9.66E-03  -1.182E-04   9.72E-03  9.65E-03  9.61E-03  9.59E-03  9.58E-03  9.58E-03  9.59E-03  9.61E-03  9.65E-03  9.72E-03
 17 BZA      (D)  1.16E-03     1.29E-03   1.281E-04   1.22E-03  1.29E-03  1.34E-03  1.36E-03  1.38E-03  1.38E-03  1.36E-03  1.34E-03  1.29E-03  1.22E-03
 18 O        (S)  0.           8.26E-10   8.263E-10   7.50E-10  8.30E-10  8.73E-10  9.03E-10  9.16E-10  9.16E-10  9.03E-10  8.75E-10  8.30E-10  7.5[illegible]
 19 CRIG     (S)  0.           6.37E-09   6.370E-09   6.30E-09  6.38E-09  6.42E-09  6.44E-09  6.45E-09  6.45E-09  6.44E-09  6.42E-09  6.38E-09  6.30E-09
 20 MCRG     (S)  0.           4.47E-09   4.470E-09   4.44E-09  4.48E-09  4.49E-09  4.50E-09  4.50E-09  4.50E-09  4.50E-09  4.49E-09  4.48E-09  4.44E-09
 21 OH       (S)  0.           1.91E-07   1.913E-07   1.78E-07  1.93E-07  2.00E-07  2.05E-07  2.07E-07  2.07E-07  2.05E-07  2.00E-07  1.93E-07  1.78E-07
 22 RAO2     (S)  0.           1.78E-06   1.782E-06   1.78E-06  1.79E-06  1.78E-06  1.78E-06  1.78E-06  1.78E-06  1.78E-06  1.78E-06  1.79E-06  1.78E-06
 23 RBO2     (S)  0.           1.97E-06   1.972E-06   1.97E-06  1.98E-06  1.97E-06  1.97E-06  1.96E-06  1.96E-06  1.97E-06  1.97E-06  1.98E-06  1.97E-06
 24 MEO2     (S)  0.           3.42E-05   3.424E-05   3.44E-05  3.42E-05  3.41E-05  3.40E-05  3.40E-05  3.40E-05  3.40E-05  3.41E-05  3.42E-05  3.44E-05
 25 ACO3     (S)  0.           1.13E-05   1.133E-05   1.14E-05  1.13E-05  1.13E-05  1.13E-05  1.13E-05  1.13E-05  1.13E-05  1.13E-05  1.13E-05  1.14E-05
 26 NO3      (S)  0.           8.86E-08   8.856E-08   7.96E-08  8.88E-08  9.47E-08  9.85E-08  1.00E-07  1.00E-07  9.85E-08  9.47E-08  8.88E-08  7.9[illegible]
 27 Y        (S)  0.           1.20E-02   1.199E-02   1.16E-02  1.20E-02  1.21E-02  1.22E-02  1.22E-02  1.22E-02  1.22E-02  1.21E-02  1.20E-02  1.1[illegible]
 28 X        (S)  0.           9.54E-09   9.544E-09   8.95E-09  9.59E-09  9.96E-09  1.02E-08  1.03E-08  1.03E-08  1.02E-08  9.96E-09  9.59E-09  8.9[illegible]
 29 W        (S)  0.           9.14E-09   9.137E-09   8.77E-09  9.21E-09  9.40E-09  9.51E-09  9.55E-09  9.55E-09  9.51E-09  9.40E-09  9.21E-09  8.77E-09
 30 HNO3     (U)  0.           1.31E-03   1.307E-03   7.73E-04  1.36E-03  1.68E-03  1.87E-03  1.96E-03  1.96E-03  1.87E-03  1.68E-03  1.36E-03  7.73E-04
 31 CO2      (U)  0.           2.42E-03   2.415E-03   1.62E-03  2.82E-03  2.98E-03  3.24E-03  3.36E-03  3.36E-03  3.24E-03  2.98E-03  2.82E-03  1.62E-03
 32 O2       (U)  0.           7.49E-02   7.492E-02   4.70E-02  7.79E-02  9.46E-02  1.04E-01  1.09E-01  1.09E-01  1.04E-01  9.46E-02  7.79E-02  4.70E-02
 33 AERS     (U)  0.           1.14E+00   1.144E+00   6.74E-01  1.19E+00  1.47E+00  1.65E+00  1.73E+00  1.73E+00  1.65E+00  1.47E+00  1.19E+00  6.74E-01
 34 AERO     (U)  0.           1.49E-02   1.494E-02   1.07E-02  1.57E-02  1.80E-02  1.92E-02  1.98E-02  1.98E-02  1.92E-02  1.80E-02  1.57E-02  1.07E-02
 35 H2O      (I)  0.           1.90E+04   1.900E+04   1.90E 04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E-04  1.9[illegible]

                                                                           CELLS
                                 -----------------------------------------------------------------------------------------------------------
                                      1          2          3          4          5          6          7          8          9         10
      CELL DEPTHS (M)             1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03
      CELL WIDTHS (M)             2.39E+02   1.14E+02   8.67E+01   7.53E+01   7.09E+01   7.09E+01   7.53E+01   8.67E+01   1.14E+02   2.39E+02
 CELL CENTERLINES (M)            -4.67E+02  -2.90E+02  -1.90E+02  -1.09E+02  -3.54E+01   3.54E+01   1.09E+02   1.90E+02   2.90E+02   4.67E+02

  CELL BOUNDARIES (M)   -5.87E+02  -3.47E+02  -2.33E+02  -1.46E+02  -7.09E+01   0.          7.09E+01   1.46E+02   2.33E+02   3.47E+02   5.87E+02
 DIFFUSIVITIES (M2/S)   0.          2.09E+01   2.71E+01   2.93E+01   3.03E+01   0.          3.03E+01   2.93E+01   2.71E+01   2.09E+01   0.
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Figure 15 (Continued).

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 TIME: 5.00E+01 MIN           PLUME WIDTH: 1.434E+03 M       SIGMA Y: 3.55E+02 M        WIND SPEED: 4.00E+00 M/SEC
FETCH: 1.21E+04 METERS        PLUME DEPTH: 1.230E+03 M                                   EI FACTOR: 4.94E-01
AERS CONC. IN MICRO-G/M**3

                                 PLUME     PLUME-                                          CELLS
 SPECIES        AMBIENT          AVE.       AMB      --------------------------------------------------------------------------------------------------
                                                          1        2        3        4        5        6        7        8        9        10
 1 TRAC  (D)  0.              2.71E-03  2.710E-03  1.33E-03 2.70E-03 3.67E-03 4.22E-03 4.49E-03 4.49E-03 4.22E-03 3.67E-03 2.70E-03 1.33E-03
 2 TEST  (D)  1.00E+00        1.00E+00 -4.263E-14  1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2   (D)  5.70E-03        6.70E-03  9.949E-04  6.22E-03 6.72E-03 7.03E-03 7.22E-03 7.31E-03 7.31E-03 7.22E-03 7.03E-03 6.72E-03 6.22E-03
 4 NO    (D)  5.94E-04        6.72E-04  7.783E-05  6.38E-04 6.73E-04 6.93E-04 7.08E-04 7.14E-04 7.14E-04 7.08E-04 6.93E-04 6.73E-04 6.38E-04
 5 O3    (D)  9.43E-02        1.02E-01  7.818E-03  9.09E-02 1.03E-01 1.05E-01 1.06E-01 1.07E-01 1.07E-01 1.06E-01 1.05E-01 1.03E-01 9.09E-02
 6 BO2   (D)  0.              7.77E-05  7.767E-05  7.71E-05 7.79E-05 7.81E-05 7.82E-05 7.82E-05 7.82E-05 7.82E-05 7.81E-05 7.79E-05 7.71E-05
 7 CO    (D)  6.07E-01        6.08E-01  4.009E-04  6.07E-01 6.08E-01 6.08E-01 6.08E-01 6.08E-01 6.08E-01 6.08E-01 6.08E-01 6.08E-01 6.07E-01
 8 PAN   (D)  3.70E-03        4.14E-03  4.343E-04  3.90E-03 4.14E-03 4.30E-03 4.40E-03 4.43E-03 4.43E-03 4.40E-03 4.30E-03 4.14E-03 3.90E-03
 9 OLE   (D)  6.59E-03        6.34E-03 -2.503E-04  6.47E-03 6.33E-03 6.24E-03 6.19E-03 6.16E-03 6.16E-03 6.19E-03 6.24E-03 6.33E-03 6.47E-03
10 CARB  (D)  7.28E-02        7.34E-02  5.767E-04  7.23E-02 7.33E-02 7.39E-02 7.44E-02 7.46E-02 7.46E-02 7.44E-02 7.39E-02 7.33E-02 7.23E-02
11 PAR   (D)  3.41E-01        3.39E-01 -2.227E-03  3.39E-01 3.39E-01 3.38E-01 3.38E-01 3.38E-01 3.38E-01 3.38E-01 3.38E-01 3.39E-01 3.39E-01
12 ARO   (D)  1.10E-01        1.08E-01 -2.219E-03  1.09E-01 1.08E-01 1.07E-01 1.06E-01 1.06E-01 1.06E-01 1.06E-01 1.07E-01 1.08E-01 1.09E-01
13 SO2   (D)  1.96E-02        2.38E-02  4.267E-03  2.17E-02 2.40E-02 2.54E-02 2.62E-02 2.66E-02 2.66E-02 2.62E-02 2.54E-02 2.40E-02 2.17E-02
14 HSO3  (D)  0.              1.21E-05  1.207E-05  1.04E-05 1.24E-05 1.32E-05 1.37E-05 1.39E-05 1.39E-05 1.37E-05 1.32E-05 1.24E-05 1.04E-05
15 HSO4  (D)  0.              9.67E-08  9.673E-08  8.30E-08 9.92E-08 1.03E-07 1.08E-07 1.09E-07 1.09E-07 1.08E-07 1.03E-07 9.92E-08 8.30E-08
16 ETH   (D)  9.58E-03        9.47E-03 -1.087E-04  9.53E-03 9.47E-03 9.43E-03 9.41E-03 9.40E-03 9.40E-03 9.41E-03 9.43E-03 9.47E-03 9.53E-03
17 BZA   (D)  9.66E-04        1.06E-03  9.720E-05  1.02E-03 1.07E-03 1.10E-03 1.11E-03 1.12E-03 1.12E-03 1.11E-03 1.10E-03 1.07E-03 1.02E-03
18 O     (S)  0.              6.13E-10  6.130E-10  5.69E-10 6.15E-10 6.43E-10 6.60E-10 6.68E-10 6.68E-10 6.60E-10 6.43E-10 6.15E-10 5.69E-10
19 CRIG  (S)  0.              6.21E-09  6.212E-09  6.14E-09 6.23E-09 6.27E-09 6.29E-09 6.30E-09 6.30E-09 6.29E-09 6.27E-09 6.23E-09 6.14E-09
20 MCRG  (S)  0.              4.29E-09  4.287E-09  4.26E-09 4.30E-09 4.31E-09 4.32E-09 4.32E-09 4.32E-09 4.32E-09 4.31E-09 4.30E-09 4.26E-09
21 OH    (S)  0.              1.38E-07  1.380E-07  1.30E-07 1.39E-07 1.43E-07 1.46E-07 1.48E-07 1.48E-07 1.46E-07 1.43E-07 1.39E-07 1.30E-07
22 RAO2  (S)  0.              1.29E-06  1.286E-06  1.29E-06 1.29E-06 1.28E-06 1.28E-06 1.28E-06 1.28E-06 1.28E-06 1.28E-06 1.29E-06 1.29E-06
23 RBO2  (S)  0.              1.84E-06  1.835E-06  1.83E-06 1.84E-06 1.84E-06 1.84E-06 1.83E-06 1.83E-06 1.84E-06 1.84E-06 1.84E-06 1.83E-06
24 MEO2  (S)  0.              3.43E-05  3.433E-05  3.44E-05 3.43E-05 3.43E-05 3.42E-05 3.42E-05 3.42E-05 3.42E-05 3.43E-05 3.43E-05 3.44E-05
25 ACO3  (S)  0.              1.31E-05  1.309E-05  1.31E-05 1.31E-05 1.30E-05 1.30E-05 1.30E-05 1.30E-05 1.30E-05 1.30E-05 1.31E-05 1.31E-05
26 NO3   (S)  0.              9.55E-08  9.545E-08  8.68E-08 9.57E-08 1.01E-07 1.05E-07 1.07E-07 1.07E-07 1.05E-07 1.01E-07 9.57E-08 8.68E-08
27 Y     (S)  0.              9.46E-03  9.464E-03  9.36E-03 9.50E-03 9.54E-03 9.57E-03 9.58E-03 9.58E-03 9.57E-03 9.54E-03 9.50E-03 9.36E-03
28 X     (S)  0.              7.40E-09  7.405E-09  7.03E-09 7.43E-09 7.66E-09 7.81E-09 7.88E-09 7.88E-09 7.81E-09 7.66E-09 7.43E-09 7.03E-09
29 W     (S)  0.              6.06E-09  6.065E-09  5.86E-09 6.11E-09 6.21E-09 6.27E-09 6.29E-09 6.29E-09 6.27E-09 6.21E-09 6.11E-09 5.86E-09
30 HNO3  (U)  0.              1.29E-03  1.292E-03  7.59E-04 1.34E-03 1.67E-03 1.86E-03 1.95E-03 1.95E-03 1.86E-03 1.67E-03 1.34E-03 7.59E-04
31 CO2   (U)  0.              2.71E-03  2.713E-03  1.00E-03 2.84E-03 3.36E-03 3.66E-03 3.79E-03 3.79E-03 3.66E-03 3.36E-03 2.84E-03 1.00E-03
32 O2    (U)  0.              7.95E-02  7.949E-02  5.00E-02 8.28E-02 1.00E-01 1.11E-01 1.15E-01 1.15E-01 1.11E-01 1.00E-01 8.28E-02 5.00E-02
33 AERS  (U)  0.              1.19E+00  1.186E+00  6.98E-01 1.23E+00 1.53E+00 1.70E+00 1.79E+00 1.79E+00 1.70E+00 1.53E+00 1.23E+00 6.98E-01
34 AERO  (U)  0.              1.83E-02  1.827E-02  1.28E-02 1.92E-02 2.22E-02 2.39E-02 2.46E-02 2.46E-02 2.39E-02 2.22E-02 1.92E-02 1.28E-02
35 H2O   (I)  0.              1.90E+04  1.900E+04  1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                         CELLS
                                  -----------------------------------------------------------------------------------------------------
                                      1         2         3         4         5         6         7         8         9         10
         CELL DEPTHS (M)           1.23E+03  1.23E+03  1.23E+03  1.23E+03  1.23E+03  1.23E+03  1.23E+03  1.23E+03  1.23E+03  1.23E+03
         CELL WIDTHS (M)           2.93E+02  1.40E+02  1.06E+02  9.21E+01  8.66E+01  8.66E+01  9.21E+01  1.06E+02  1.40E+02  2.93E+02
    CELL CENTERLINES (M)          -5.71E+02 -3.55E+02 -2.32E+02 -1.33E+02 -4.33E+01  4.33E+01  1.33E+02  2.32E+02  3.55E+02  5.71E+02

     CELL BOUNDARIES (M)   -7.17E+02 -4.25E+02 -2.85E+02 -1.79E+02 -8.66E+01  0.          8.66E+01  1.79E+02  2.85E+02  4.25E+02  7.17E+02
    DIFFUSIVITIES (M2/S)   0.         2.48E+01  3.21E+01  3.47E+01  3.62E+01  0.          3.62E+01  3.47E+01  3.21E+01  2.48E+01  0.
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Figure 15 (Continued).

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 TIME= 6.00E+01 MIN.              PLUME WIDTH= 1.688E+03 M.     SIGMA Y= 4.219E+02 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 1.44E+04 METERS            PLUME DEPTH= 1.232E+03 M.                                EJ FACTOR= 3.32E-01
AERS CONC. IN MICRO-G/M**3

                              PLUME      PLUME-                                                  CELLS
  SPECIES         AMBIENT      AVE.        AMB      --------------------------------------------------------------------------------------------------------
                                                        1         2         3         4         5         6         7         8         9        10
  1 TRAC  (D)  0.          2.30E-03   2.301E-03   1.13E-03  2.36E-03  3.12E-03  3.58E-03  3.81E-03  3.81E-03  3.58E-03  3.12E-03  2.36E-03  1.13E-03
  2 TEST  (D)  1.00E+00    1.00E+00  -4.974E-14   1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
  3 NO2   (D)  4.97E-03    5.69E-03   7.181E-04   5.34E-03  5.71E-03  5.93E-03  6.06E-03  6.12E-03  6.12E-03  6.06E-03  5.93E-03  5.71E-03  5.34E-03
  4 NO    (D)  4.65E-04    5.09E-04   4.436E-05   4.90E-04  5.10E-04  5.23E-04  5.31E-04  5.35E-04  5.35E-04  5.31E-04  5.23E-04  5.10E-04  4.90E-04
  5 O3    (D)  9.80E-02    1.05E-01   7.515E-03   1.00E-01  1.04E-01  1.06E-01  1.07E-01  1.08E-01  1.08E-01  1.07E-01  1.06E-01  1.04E-01  1.00E-01
  6 HO2   (D)  0.          7.16E-05   7.156E-05   7.10E-05  7.18E-05  7.20E-05  7.21E-05  7.21E-05  7.21E-05  7.21E-05  7.20E-05  7.18E-05  7.10E-05
  7 CO    (D)  6.09E-01    6.09E-01   4.031E-04   6.09E-01  6.09E-01  6.09E-01  6.09E-01  6.09E-01  6.09E-01  6.09E-01  6.09E-01  6.09E-01  6.09E-01
  8 PAN   (D)  4.11E-03    4.54E-03   4.310E-04   4.31E-03  4.55E-03  4.70E-03  4.80E-03  4.84E-03  4.84E-03  4.80E-03  4.70E-03  4.55E-03  4.31E-03
  9 OLE   (D)  6.20E-03    5.97E-03  -2.307E-04   6.10E-03  5.97E-03  5.89E-03  5.84E-03  5.82E-03  5.82E-03  5.84E-03  5.89E-03  5.97E-03  6.10E-03
 10 CARB  (D)  7.54E-02    7.59E-02   4.610E-04   7.52E-02  7.58E-02  7.63E-02  7.66E-02  7.68E-02  7.68E-02  7.66E-02  7.63E-02  7.58E-02  7.52E-02
 11 PAR   (D)  3.40E-01    3.38E-01  -2.240E-03   3.39E-01  3.38E-01  3.37E-01  3.37E-01  3.37E-01  3.37E-01  3.37E-01  3.37E-01  3.38E-01  3.39E-01
 12 ARO   (D)  1.07E-01    1.05E-01  -2.077E-03   1.06E-01  1.05E-01  1.05E-01  1.04E-01  1.04E-01  1.04E-01  1.04E-01  1.05E-01  1.05E-01  1.06E-01
 13 SO2   (D)  1.98E-02    2.31E-02   3.611E-03   2.13E-02  2.32E-02  2.44E-02  2.52E-02  2.55E-02  2.55E-02  2.52E-02  2.44E-02  2.32E-02  2.13E-02
 14 HSO5  (D)  0.          1.11E-05   1.108E-05   9.65E-06  1.14E-05  1.21E-05  1.25E-05  1.27E-05  1.27E-05  1.25E-05  1.21E-05  1.14E-05  9.65E-06
 15 HSO4  (D)  0.          7.93E-08   7.930E-08   7.08E-08  8.14E-08  8.54E-08  8.76E-08  8.85E-08  8.85E-08  8.76E-08  8.54E-08  8.14E-08  7.08E-08
 16 ETH   (D)  9.44E-03    9.34E-03  -1.039E-04   9.39E-03  9.33E-03  9.30E-03  9.28E-03  9.27E-03  9.27E-03  9.28E-03  9.30E-03  9.33E-03  9.39E-03
 17 BZA   (D)  8.03E-04    8.75E-04   7.182E-05   8.41E-04  8.77E-04  8.98E-04  9.11E-04  9.17E-04  9.17E-04  9.11E-04  8.98E-04  8.77E-04  8.41E-04
 18 O     (S)  0.          4.86E-10   4.856E-10   4.28E-10  4.57E-10  4.75E-10  4.85E-10  4.91E-10  4.91E-10  4.85E-10  4.75E-10  4.57E-10  4.28E-10
 19 CRIC  (S)  0.          6.03E-09   6.033E-09   5.96E-09  6.03E-09  6.09E-09  6.11E-09  6.12E-09  6.12E-09  6.11E-09  6.09E-09  6.03E-09  5.96E-09
 20 MCRG  (S)  0.          4.11E-09   4.108E-09   4.08E-09  4.12E-09  4.13E-09  4.14E-09  4.14E-09  4.14E-09  4.14E-09  4.13E-09  4.12E-09  4.08E-09
 21 OH    (S)  0.          9.97E-08   9.971E-08   9.50E-08  1.00E-07  1.03E-07  1.05E-07  1.06E-07  1.06E-07  1.05E-07  1.03E-07  1.00E-07  9.50E-08
 22 RAO2  (S)  0.          9.32E-07   9.322E-07   9.38E-07  9.34E-07  9.29E-07  9.25E-07  9.23E-07  9.23E-07  9.25E-07  9.29E-07  9.34E-07  9.38E-07
 23 RBO2  (S)  0.          1.68E-06   1.681E-06   1.67E-06  1.69E-06  1.69E-06  1.68E-06  1.68E-06  1.68E-06  1.68E-06  1.69E-06  1.69E-06  1.67E-06
 24 MEO2  (S)  0.          3.33E-05   3.332E-05   3.34E-05  3.33E-05  3.33E-05  3.32E-05  3.32E-05  3.32E-05  3.32E-05  3.33E-05  3.33E-05  3.34E-05
 25 ACO3  (S)  0.          1.46E-05   1.462E-05   1.47E-05  1.46E-05  1.46E-05  1.46E-05  1.46E-05  1.46E-05  1.46E-05  1.46E-05  1.46E-05  1.47E-05
 26 NO3   (S)  0.          1.07E-07   1.069E-07   9.81E-08  1.07E-07  1.13E-07  1.17E-07  1.18E-07  1.18E-07  1.17E-07  1.13E-07  1.07E-07  9.81E-08
 27 Y     (S)  0.          7.27E-03   7.272E-03   7.22E-03  7.29E-03  7.31E-03  7.32E-03  7.32E-03  7.32E-03  7.32E-03  7.31E-03  7.29E-03  7.22E-03
 28 X     (S)  0.          5.69E-09   5.690E-09   5.45E-09  5.71E-09  5.85E-09  5.94E-09  5.99E-09  5.99E-09  5.94E-09  5.85E-09  5.71E-09  5.45E-09
 29 W     (S)  0.          4.15E-09   4.148E-09   4.03E-09  4.17E-09  4.23E-09  4.27E-09  4.28E-09  4.28E-09  4.27E-09  4.23E-09  4.17E-09  4.03E-09
 30 HNO3  (U)  0.          1.24E-03   1.237E-03   7.18E-04  1.28E-03  1.60E-03  1.79E-03  1.88E-03  1.88E-03  1.79E-03  1.60E-03  1.28E-03  7.18E-04
 31 CO2   (U)  0.          2.88E-03   2.880E-03   1.89E-03  3.01E-03  3.58E-03  3.91E-03  4.06E-03  4.06E-03  3.91E-03  3.58E-03  3.01E-03  1.89E-03
 32 O2    (U)  0.          8.18E-02   8.179E-02   5.13E-02  8.52E-02  1.03E-01  1.14E-01  1.19E-01  1.19E-01  1.14E-01  1.03E-01  8.52E-02  5.13E-02
 33 AERS  (U)  0.          1.18E+00   1.180E+00   6.91E-01  1.23E+00  1.52E+00  1.70E+00  1.78E+00  1.78E+00  1.70E+00  1.52E+00  1.23E+00  6.91E-01
 34 AERO  (U)  0.          2.03E-02   2.031E-02   1.39E-02  2.13E-02  2.49E-02  2.69E-02  2.78E-02  2.78E-02  2.69E-02  2.49E-02  2.13E-02  1.39E-02
 35 H2O   (I)  0.          1.90E+04   1.900E+04   1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04

                                                                           CELLS
                                 ---------------------------------------------------------------------------------------------------------------
                                        1          2          3          4          5          6          7          8          9         10
           CELL DEPTHS (M)          1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03   1.23E+03
           CELL WIDTHS (M)          3.44E+02   1.65E+02   1.25E+02   1.08E+02   1.02E+02   1.02E+02   1.08E+02   1.25E+02   1.65E+02   3.44E+02
      CELL CENTERLINES (M)         -6.72E+02  -4.17E+02  -2.73E+02  -1.56E+02  -3.10E+01   5.10E+01   1.56E+02   2.73E+02   4.17E+02   6.72E+02

      CELL BOUNDARIES (M)  -8.44E+02 -5.00E+02 -3.35E+02 -2.10E+02 -1.02E+02  0.            1.02E+02  2.10E+02  3.35E+02  5.00E+02  8.44E+02
    DIFFUSIVITIES (M2/S)    0.                 2.92E+01  3.78E+01  4.08E+01  4.26E+01  0.            4.26E+01  4.08E+01  3.78E+01  2.92E+01  0.
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Figure 15 (Continued).

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 TIME: 7.00E+01 MIN.              PLUME WIDTH: 1.93E+03 M.      SIGMA Y: 4.04E+02 M.      WIND SPEED: 4.00E+00 M/SEC
FETCH: 1.69E+04 METERS            PLUME DEPTH: 1.23E+03 M                                    KZ FACTOR: 3.00E-01
ALL CONC. IN MICRO-G/M**3

                                                                                    CELLS
                                PLUME     PLUME-    ---------------------------------------------------------------------------------------------------
  SPECIES          AMBIENT      AVE.       AMB          1        2        3        4        5        6        7        8        9       10
  1 TRAC  (D)  0.         2.00E-03  1.998E-03   9.79E-04 2.08E-03 2.71E-03 3.11E-03 3.31E-03 3.31E-03 3.11E-03 2.71E-03 2.08E-03 9.79E-04
  2 TEST  (D)  1.00E+00   1.00E+00 -2.442E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
  3 NO2   (D)  4.43E-03   4.97E-03  5.394E-04   4.71E-03 4.98E-03 5.13E-03 5.23E-03 5.29E-03 5.29E-03 5.23E-03 5.15E-03 4.98E-03 4.71E-03
  4 NO    (D)  3.04E-04   3.91E-04  8.721E-05   3.79E-04 3.92E-04 3.99E-04 4.04E-04 4.06E-04 4.06E-04 4.04E-04 3.99E-04 3.92E-04 3.79E-04
  5 O3    (D)  9.65E-02   1.04E-01  7.155E-03   1.01E-01 1.04E-01 1.06E-01 1.07E-01 1.08E-01 1.08E-01 1.07E-01 1.06E-01 1.04E-01 1.01E-01
  6 HO2   (D)  0.         6.49E-05  6.486E-05   6.44E-05 6.50E-05 6.52E-05 6.53E-05 6.53E-05 6.53E-05 6.53E-05 6.52E-05 6.50E-05 6.44E-05
  7 CO    (D)  6.10E-01   6.10E-01  3.863E-04   6.10E-01 6.10E-01 6.10E-01 6.10E-01 6.11E-01 6.11E-01 6.10E-01 6.10E-01 6.10E-01 6.10E-01
  8 FAR   (D)  4.39E-03   4.88E-03  4.878E-04   4.58E-03 4.81E-03 4.95E-03 5.04E-03 5.08E-03 5.08E-03 5.04E-03 4.95E-03 4.81E-03 4.58E-03
  9 OLE   (D)  5.91E-03   5.70E-03 -2.104E-04   5.81E-03 5.70E-03 5.62E-03 5.55E-03 5.56E-03 5.56E-03 5.55E-03 5.62E-03 5.70E-03 5.81E-03
 10 CARB  (D)  7.71E-02   7.75E-02  4.147E-04   7.70E-02 7.74E-02 7.78E-02 7.81E-02 7.82E-02 7.82E-02 7.81E-02 7.78E-02 7.74E-02 7.70E-02
 11 PAR   (D)  3.39E-01   3.37E-01 -2.155E-03   3.38E-01 3.37E-01 3.36E-01 3.36E-01 3.36E-01 3.36E-01 3.36E-01 3.36E-01 3.37E-01 3.38E-01
 12 ARO   (D)  1.05E-01   1.04E-01 -1.905E-03   1.03E-01 1.03E-01 1.03E-01 1.02E-01 1.02E-01 1.02E-01 1.02E-01 1.03E-01 1.03E-01 1.03E-01
 13 SO2   (D)  1.95E-02   2.26E-02  3.127E-03   2.10E-02 2.27E-02 2.37E-02 2.44E-02 2.47E-02 2.47E-02 2.44E-02 2.37E-02 2.27E-02 2.10E-02
 14 HSO3  (D)  0.         1.02E-05  1.017E-05   8.91E-06 1.05E-05 1.11E-05 1.14E-05 1.16E-05 1.16E-05 1.14E-05 1.11E-05 1.05E-05 8.91E-06
 15 HSO4  (D)  0.         6.40E-08  6.397E-08   5.73E-08 6.57E-08 6.87E-08 7.03E-08 7.10E-08 7.10E-08 7.03E-08 6.87E-08 6.57E-08 5.73E-08
 16 ETH   (D)  9.33E-03   9.23E-03 -9.700E-05   9.26E-03 9.23E-03 9.20E-03 9.16E-03 9.17E-03 9.17E-03 9.16E-03 9.20E-03 9.23E-03 9.26E-03
 17 HZA   (D)  6.84E-04   7.33E-04  4.893E-05   7.11E-04 7.37E-04 7.52E-04 7.61E-04 7.65E-04 7.65E-04 7.61E-04 7.52E-04 7.37E-04 7.11E-04
 18 O     (S)  0.         3.39E-10  3.391E-10   3.22E-10 3.40E-10 3.51E-10 3.58E-10 3.61E-10 3.61E-10 3.58E-10 3.51E-10 3.40E-10 3.22E-10
 19 CRIG  (S)  0.         5.86E-09  5.856E-09   5.78E-09 5.87E-09 5.91E-09 5.93E-09 5.94E-09 5.94E-09 5.93E-09 5.91E-09 5.87E-09 5.78E-09
 20 MCRG  (S)  0.         3.94E-09  3.941E-09   3.91E-09 3.95E-09 3.96E-09 3.97E-09 3.97E-09 3.97E-09 3.97E-09 3.96E-09 3.95E-09 3.91E-09
 21 OH    (S)  0.         7.13E-08  7.125E-08   6.85E-08 7.16E-08 7.32E-08 7.42E-08 7.46E-08 7.46E-08 7.42E-08 7.32E-08 7.16E-08 6.85E-08
 22 RAO2  (S)  0.         6.70E-07  6.703E-07   6.77E-07 6.71E-07 6.66E-07 6.62E-07 6.59E-07 6.59E-07 6.62E-07 6.66E-07 6.71E-07 6.77E-07
 23 RBO2  (S)  0.         1.51E-06  1.509E-06   1.50E-06 1.51E-06 1.51E-06 1.51E-06 1.51E-06 1.51E-06 1.51E-06 1.51E-06 1.51E-06 1.50E-06
 24 MEO2  (S)  0.         3.18E-05  3.179E-05   3.18E-05 3.18E-05 3.18E-05 3.17E-05 3.17E-05 3.17E-05 3.17E-05 3.18E-05 3.18E-05 3.18E-05
 25 ACO3  (S)  0.         1.60E-05  1.593E-05   1.60E-05 1.59E-05 1.59E-05 1.59E-05 1.59E-05 1.59E-05 1.59E-05 1.59E-05 1.59E-05 1.60E-05
 26 POO   (S)  0.         1.24E-07  1.238E-07   1.14E-07 1.24E-07 1.30E-07 1.34E-07 1.36E-07 1.36E-07 1.34E-07 1.30E-07 1.24E-07 1.14E-07
 27 Y     (S)  0.         5.49E-03  5.494E-03   5.40E-03 5.51E-03 5.51E-03 5.50E-03 5.50E-03 5.50E-03 5.50E-03 5.51E-03 5.51E-03 5.40E-03
 28 X     (S)  0.         4.33E-09  4.326E-09   4.18E-09 4.34E-09 4.43E-09 4.48E-09 4.50E-09 4.50E-09 4.48E-09 4.43E-09 4.34E-09 4.18E-09
 29 W     (S)  0.         2.86E-09  2.856E-09   2.79E-09 2.87E-09 2.90E-09 2.92E-09 2.93E-09 2.93E-09 2.92E-09 2.90E-09 2.87E-09 2.79E-09
 30 HNO3  (U)  0.         1.17E-03  1.167E-03   6.69E-04 1.21E-03 1.52E-03 1.70E-03 1.79E-03 1.79E-03 1.70E-03 1.52E-03 1.21E-03 6.69E-04
 31 CO2   (U)  0.         2.96E-03  2.958E-03   1.92E-03 3.09E-03 3.70E-03 4.04E-03 4.20E-03 4.20E-03 4.04E-03 3.70E-03 3.09E-03 1.92E-03
 32 O2    (U)  0.         8.23E-02  8.232E-02   5.13E-02 8.57E-02 1.04E-01 1.15E-01 1.20E-01 1.20E-01 1.15E-01 1.04E-01 8.57E-02 5.13E-02
 33 AERS  (U)  0.         1.15E+00  1.149E+00   6.67E-01 1.19E+00 1.49E+00 1.66E+00 1.74E+00 1.74E+00 1.66E+00 1.49E+00 1.19E+00 6.67E-01
 34 AERO  (U)  0.         2.14E-02  2.135E-02   1.43E-02 2.24E-02 2.64E-02 2.86E-02 2.96E-02 2.96E-02 2.86E-02 2.64E-02 2.24E-02 1.43E-02
 35 H2O   (I)  0.         1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                         CELLS
                           ----------------------------------------------------------------------------------------------------------
                                 1          2          3          4          5          6          7          8          9         10
      CELL DEPTHS (M)       1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03
      CELL WIDTHS (M)       3.93E+02   1.89E+02   1.43E+02   1.24E+02   1.17E+02   1.17E+02   1.24E+02   1.43E+02   1.89E+02   3.93E+02
CELL CENTERLINES (M)       -7.72E+02  -4.79E+02  -3.13E+02  -1.79E+02  -5.85E+01   5.85E+01   1.79E+02   3.13E+02   4.79E+02   7.72E+02

 CELL BOUNDARIES (M)  -9.69E+02 -5.74E+02 -3.85E+02 -2.42E+02 -1.17E+02  0.          1.17E+02  2.42E+02  3.85E+02  5.74E+02  9.69E+02
DIFFUSIVITIES (M2/S)   0.         3.27E+01  4.24E+01  4.58E+01  4.77E+01  0.          4.77E+01  4.58E+01  4.24E+01  3.27E+01  0.
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Figure 15 (Continued).

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                                                                    ----------------------------------------------------------------
 TIME: 8.00E+01 MIN        PLUME WIDTH: 2.186E+03 M.     SIGMA Y: 5.465E+02 M      WIND SPEED: 4.00E+00 M/SEC
FETCH: 1.93E+04 METERS     PLUME DEPTH: 1.238E+03 M.                                KI FACTOR: 2.74E-01
AERO CONC. IN MICRO-G/M**3

                                                                                            CELLS
                         PLUME     PLUME-    ---------------------------------------------------------------------------------------------------
  SPECIES     AMBIENT     AVE.       AMB         1         2         3         4         5         6         7         8         9        10
 1 TRAC (D) 0.          1.77E-03  1.767E-03  8.66E-04  1.81E-03  2.39E-03  2.75E-03  2.93E-03  2.93E-03  2.75E-03  2.39E-03  1.81E-03  8.66E-04
 2 TEST (D) 1.00E+00  1.00E+00 -4.974E-14  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
 3 NO2  (D) 4.00E-03  4.42E-03  4.193E-04  4.22E-03  4.43E-03  4.56E-03  4.63E-03  4.67E-03  4.67E-03  4.63E-03  4.56E-03  4.43E-03  4.22E-03
 4 NO   (D) 3.06E-04  3.22E-04  1.666E-05  3.15E-04  3.23E-04  3.28E-04  3.31E-04  3.33E-04  3.33E-04  3.31E-04  3.28E-04  3.23E-04  3.18E-04
 5 O3   (D) 9.66E-02  1.03E-01  6.773E-03  1.01E-01  1.04E-01  1.05E-01  1.07E-01  1.07E-01  1.07E-01  1.07E-01  1.05E-01  1.04E-01  1.01E-01
 6 FO2  (D) 0.          [illegible] [illegible] [illegible] [illegible] 6.17E-03  6.16E-03  6.19E-03  [illegible] [illegible] 6.17E-03  6.16E-03  6.16E-03
 7 CO   (D) 6.11E-01  6.11E-01  3.615E-04  6.11E-01  6.11E-01  6.11E-01  6.12E-01  6.12E-01  6.12E-01  6.12E-01  6.11E-01  6.11E-01  6.11E-01
 8 PAR  (D) 4.57E-03  4.93E-03  3.609E-04  4.73E-03  4.96E-03  5.10E-03  5.18E-03  5.22E-03  5.22E-03  5.18E-03  5.10E-03  4.96E-03  4.73E-03
 9 OLE  (D) 5.67E-03  5.48E-03 -1.925E-04  5.58E-03  5.48E-03  5.41E-03  5.37E-03  5.35E-03  5.35E-03  5.37E-03  5.41E-03  5.48E-03  5.50E-03
10 CARB (D) 7.82E-02  7.86E-02  3.784E-04  7.82E-02  7.86E-02  7.89E-02  7.91E-02  7.92E-02  7.92E-02  7.91E-02  7.89E-02  7.86E-02  7.82E-02
11 PAR  (D) 3.38E-01  3.36E-01 -2.037E-03  3.37E-01  3.36E-01  3.35E-01  3.35E-01  3.35E-01  3.35E-01  3.35E-01  3.35E-01  3.36E-01  3.37E-01
12 ARO  (D) 1.04E-01  1.02E-01 -1.746E-03  1.03E-01  1.02E-01  1.02E-01  1.01E-01  1.01E-01  1.01E-01  1.01E-01  1.02E-01  1.02E-01  1.03E-01
13 SO2  (D) 1.95E-02  2.22E-02  2.766E-03  2.06E-02  2.23E-02  2.33E-02  2.38E-02  2.41E-02  2.41E-02  2.38E-02  2.32E-02  2.23E-02  2.06E-02
14 RNO3 (D) 0.          9.61E-06  9.610E-06  8.45E-06  9.59E-06  1.04E-05  1.07E-05  1.09E-05  1.09E-05  1.07E-05  1.04E-05  9.59E-06  8.45E-06
15 RSO4 (D) 0.          5.60E-08  5.603E-08  5.03E-08  5.76E-08  6.01E-08  6.14E-08  6.20E-08  6.20E-08  6.14E-08  6.01E-08  5.76E-08  5.03E-08
16 ETH  (D) 9.24E-03  9.15E-03 -9.031E-05  9.20E-03  9.15E-03  9.12E-03  9.10E-03  9.09E-03  9.09E-03  9.10E-03  9.12E-03  9.15E-03  9.20E-03
17 BZA  (D) 5.93E-04  6.31E-04  3.885E-05  6.14E-04  6.33E-04  6.44E-04  6.50E-04  6.53E-04  6.53E-04  6.50E-04  6.44E-04  6.33E-04  6.14E-04
18 O    (S) 0.          2.75E-10  2.732E-10  2.63E-10  2.76E-10  2.84E-10  2.89E-10  2.91E-10  2.91E-10  2.89E-10  2.84E-10  2.76E-10  2.63E-10
19 CRIG (S) 0.          5.69E-09  5.687E-09  5.62E-09  5.70E-09  5.74E-09  5.76E-09  5.77E-09  5.77E-09  5.76E-09  5.74E-09  5.70E-09  5.62E-09
20 MCRG (S) 0.          3.79E-09  3.789E-09  3.76E-09  3.80E-09  3.81E-09  3.82E-09  3.82E-09  3.82E-09  3.82E-09  3.81E-09  3.80E-09  3.76E-09
21 OH   (S) 0.          5.76E-08  5.756E-08  5.56E-08  5.78E-08  5.89E-08  5.96E-08  6.00E-08  6.00E-08  5.96E-08  5.89E-08  5.78E-08  5.56E-08
22 RAO2 (S) 0.          5.39E-07  5.393E-07  5.45E-07  5.40E-07  5.35E-07  5.32E-07  5.30E-07  5.30E-07  5.32E-07  5.35E-07  5.40E-07  5.45E-07
23 RBO2 (S) 0.          1.44E-06  1.436E-06  1.43E-06  1.44E-06  1.44E-06  1.44E-06  1.44E-06  1.44E-06  1.44E-06  1.44E-06  1.44E-06  1.43E-06
24 MEO2 (S) 0.          3.14E-05  3.136E-05  3.14E-05  3.14E-05  3.14E-05  3.13E-05  3.13E-05  3.13E-05  3.13E-05  3.14E-05  3.14E-05  3.14E-05
25 ACO3 (S) 0.          1.76E-05  1.760E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05  1.76E-05
26 NO3  (S) 0.          1.32E-07  1.318E-07  1.22E-07  1.32E-07  1.38E-07  1.42E-07  1.44E-07  1.44E-07  1.42E-07  1.38E-07  1.32E-07  1.22E-07
27 Y    (S) 0.          4.57E-03  4.572E-03  4.57E-03  4.58E-03  4.57E-03  4.57E-03  4.56E-03  4.56E-03  4.57E-03  4.57E-03  4.58E-03  4.57E-03
28 X    (S) 0.          3.65E-09  3.643E-09  3.54E-09  3.65E-09  3.72E-09  3.75E-09  3.77E-09  3.77E-09  3.75E-09  3.72E-09  3.65E-09  3.54E-09
29 W    (S) 0.          2.25E-09  2.247E-09  2.20E-09  2.26E-09  2.28E-09  2.29E-09  2.30E-09  2.30E-09  2.29E-09  2.28E-09  2.26E-09  2.20E-09
30 HNO3 (D) 0.          1.10E-03  1.095E-03  6.21E-04  1.14E-03  1.43E-03  1.60E-03  1.69E-03  1.69E-03  1.60E-03  1.43E-03  1.14E-03  6.21E-04
31 CO2  (D) 0.          2.99E-03  2.994E-03  1.92E-03  3.12E-03  3.73E-03  4.11E-03  4.28E-03  4.28E-03  4.11E-03  3.73E-03  3.12E-03  1.92E-03
32 O2   (D) 0.          8.20E-02  8.193E-02  5.08E-02  8.53E-02  1.04E-01  1.15E-01  1.20E-01  1.20E-01  1.15E-01  1.04E-01  8.53E-02  5.08E-02
33 AERS (D) 0.          1.11E+00  1.107E+00  6.38E-01  1.13E+00  1.44E+00  1.61E+00  1.69E+00  1.69E+00  1.61E+00  1.44E+00  1.13E+00  6.38E-01
34 AERO (D) 0.          2.18E-02  2.184E-02  1.44E-02  2.29E-02  2.72E-02  2.96E-02  3.07E-02  3.07E-02  2.96E-02  2.72E-02  2.29E-02  1.44E-02
35 H2O  (I) 0.          1.90E+04  1.900E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04

                                                                       CELLS
                          --------------------------------------------------------------------------------------------------
                               1         2         3         4         5         6         7         8         9        10
        CELL DEPTHS (M)    1.24E+03  1.24E+03  1.24E+03  1.24E+03  1.24E+03  1.24E+03  1.24E+03  1.24E+03  1.24E+03  1.24E+03
        CELL WIDTHS (M)    4.46E+02  2.13E+02  1.61E+02  1.40E+02  1.32E+02  1.32E+02  1.40E+02  1.61E+02  2.13E+02  4.46E+02
  CELL CENTERLINES (M)    -8.70E+02 -5.40E+02 -3.53E+02 -2.02E+02 -6.60E+01  6.60E+01  2.02E+02  3.53E+02  5.40E+02  8.70E+02

   CELL BOUNDARIES (M) -1.09E+03 -6.47E+02 -4.34E+02 -2.72E+02 -1.32E+02  0.        1.32E+02  2.72E+02  4.34E+02  6.47E+02  1.09E+03
  DIFFUSIVITIES (M2/S) 0.         3.69E+01  4.78E+01  5.16E+01  5.38E+01  0.        5.38E+01  5.16E+01  4.78E+01  3.69E+01  0.
```

Figure 15 (Continued).

```
 TIME= 9.00E+01 MIN.          PLUME WIDTH= 2.430E+03 M.      SIGMA Y= 6.074E+02 M.      WIND SPEED= 4.00E+00 M/SEC
FETCH= 2.17E+04 METERS        PLUME DEPTH= 1.241E+03 M.                                  KI FACTOR= 2.40E-01
AERS CONC. IN MICRO-G/M**3

                                                                              CELLS
                             PLUME      PLUME-    -------------------------------------------------------------------------------------------------------
  SPECIES        AMBIENT      AVE.        AMB         1         2         3         4         5         6         7         8         9        10
 1 TRAC (D) 0.            1.59E-03   1.587E-03   7.70E-04  1.63E-03  2.15E-03  2.47E-03  2.63E-03  2.63E-03  2.47E-03  2.15E-03  1.63E-03  7.70E-04
 2 TEST (D) 1.00E+00      1.00E+00  -6.395E-14   1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
 3 NO2  (D) [illegible]   [illegible] [illegible] 3.84E-03 4.01E-03  4.11E-03  4.17E-03  4.20E-03  4.20E-03  4.17E-03  4.11E-03  4.01E-03  3.84E-03
 4 NO   (D) 2.50E-04      2.70E-04   1.149E-05   2.64E-04  2.70E-04  2.73E-04  2.76E-04  2.77E-04  2.77E-04  2.76E-04  2.73E-04  2.70E-04  2.64E-04
 5 O3   (D) 9.66E-02      1.03E-01   6.361E-03   1.00E-01  1.03E-01  1.05E-01  1.06E-01  1.06E-01  1.06E-01  1.06E-01  1.05E-01  1.03E-01  1.00E-01
 6 BUC  (D) 0.            5.75E-05   5.751E-05   5.71E-05  5.76E-05  5.78E-05  5.78E-05  5.79E-05  5.79E-05  5.78E-05  5.78E-05  5.76E-05  5.71E-05
 7 CO   (D) 6.12E-01      6.12E-01   5.343E-04   6.12E-01  6.12E-01  6.12E-01  6.12E-01  6.13E-01  6.13E-01  6.12E-01  6.12E-01  6.12E-01  6.12E-01
 8 PAN  (D) 4.69E-03      5.05E-03   3.537E-04   4.86E-03  5.06E-03  5.18E-03  5.26E-03  5.29E-03  5.29E-03  5.26E-03  5.18E-03  5.06E-03  4.86E-03
 9 OLE  (D) 5.47E-03      5.30E-03  -1.762E-04   5.39E-03  5.29E-03  5.23E-03  5.20E-03  5.18E-03  5.18E-03  5.20E-03  5.23E-03  5.29E-03  5.39E-03
10 CARB (D) [illegible]   [illegible] [illegible] 7.90E-02 [illegible] 7.96E-02 [illegible] [illegible] [illegible] [illegible] 7.96E-02 7.94E-02 7.90E-02
11 PAR  (D) 3.37E-01      3.35E-01  -1.917E-03   3.36E-01  3.35E-01  3.35E-01  3.34E-01  3.34E-01  3.34E-01  3.34E-01  3.35E-01  3.35E-01  3.36E-01
12 ARO  (D) 1.03E-01      1.01E-01  -1.897E-03   1.02E-01  1.01E-01  1.01E-01  1.00E-01  1.00E-01  1.00E-01  1.00E-01  1.01E-01  1.01E-01  1.02E-01
13 SO2  (D) 1.95E-02      2.19E-02   2.477E-03   2.07E-02  2.20E-02  2.28E-02  2.33E-02  2.36E-02  2.36E-02  2.33E-02  2.28E-02  2.20E-02  2.07E-02
14 N2O5 (D) 0.            9.13E-06   9.126E-06   8.03E-06  9.39E-06  9.89E-06  1.02E-05  1.03E-05  1.03E-05  1.02E-05  9.89E-06  9.39E-06  8.03E-06
15 HNO4 (D) 0.            4.92E-08   4.918E-08   4.43E-08  5.06E-08  5.27E-08  5.37E-08  5.42E-08  5.42E-08  5.37E-08  5.27E-08  5.06E-08  4.43E-08
16 ETH  (D) 9.17E-03      9.08E-03  -8.418E-05   9.13E-03  9.08E-03  9.05E-03  9.03E-03  9.03E-03  9.03E-03  9.03E-03  9.05E-03  9.08E-03  9.13E-03
17 BZA  (D) 5.26E-04      5.53E-04   2.766E-05   5.40E-04  5.54E-04  5.63E-04  5.68E-04  5.70E-04  5.70E-04  5.68E-04  5.63E-04  5.54E-04  5.40E-04
18 O    (S) 0.            2.25E-10   2.251E-10   2.16E-10  2.26E-10  2.31E-10  2.35E-10  2.36E-10  2.36E-10  2.35E-10  2.31E-10  2.26E-10  2.16E-10
19 CRIG (S) 0.            5.53E-09   5.530E-09   5.46E-09  5.54E-09  5.58E-09  5.60E-09  5.61E-09  5.61E-09  5.60E-09  5.58E-09  5.54E-09  5.46E-09
20 MCRG (S) 0.            3.65E-09   3.651E-09   3.62E-09  3.66E-09  3.67E-09  3.68E-09  3.68E-09  3.68E-09  3.68E-09  3.67E-09  3.66E-09  3.62E-09
21 OH   (S) 0.            4.60E-08   4.596E-08   4.46E-08  4.61E-08  4.69E-08  4.73E-08  4.76E-08  4.76E-08  4.73E-08  4.69E-08  4.61E-08  4.46E-08
22 RAO2 (S) 0.            4.29E-07   4.289E-07   4.35E-07  4.29E-07  4.25E-07  4.22E-07  4.21E-07  4.21E-07  4.22E-07  4.25E-07  4.29E-07  4.35E-07
23 RNO2 (S) 0.            1.33E-06   1.333E-06   1.33E-06  1.34E-06  1.34E-06  1.34E-06  1.34E-06  1.34E-06  1.34E-06  1.34E-06  1.34E-06  1.33E-06
24 C2O3 (S) 0.            3.06E-03   3.058E-03   3.06E-03 [illegible] 3.06E-03 3.06E-03 [illegible] [illegible] 3.06E-03 3.06E-03  3.06E-03  3.06E-03
25 ACO3 (S) 0.            1.90E-05   1.904E-05   1.90E-05  1.90E-05  1.90E-05  1.91E-05  1.91E-05  1.91E-05  1.91E-05  1.90E-05  1.90E-05  1.90E-05
26 NO3  (S) 0.            1.44E-07   1.440E-07   1.34E-07  1.44E-07  1.51E-07  1.55E-07  1.57E-07  1.57E-07  1.55E-07  1.51E-07  1.44E-07  1.34E-07
27 Y    (S) 0.            3.76E-03   3.760E-03   3.77E-03  3.76E-03  3.75E-03  3.74E-03  3.74E-03  3.74E-03  3.74E-03  3.75E-03  3.76E-03  3.77E-03
28 X    (S) 0.            3.06E-09   3.058E-09   2.99E-09  3.06E-09  3.11E-09  3.13E-09  3.15E-09  3.15E-09  3.13E-09  3.11E-09  3.06E-09  2.99E-09
29 S    (S) 0.            1.76E-09   1.758E-09   1.73E-09  1.76E-09  1.78E-09  1.79E-09  1.79E-09  1.79E-09  1.79E-09  1.78E-09  1.76E-09  1.73E-09
30 HNO3 (U) 0             1.03E-03   1.032E-03   5.80E-04  1.07E-03  1.35E-03  1.52E-03  1.60E-03  1.60E-03  1.52E-03  1.35E-03  1.07E-03  5.80E-04
31 CO2  (U) 0             3.01E-03   3.014E-03   1.92E-03  3.14E-03  3.79E-03  4.15E-03  4.33E-03  4.33E-03  4.15E-03  3.79E-03  3.14E-03  1.92E-03
32 O2   (U) 0             8.12E-02   8.125E-02   5.01E-02  8.46E-02  1.03E-01  1.14E-01  1.19E-01  1.19E-01  1.14E-01  1.03E-01  8.46E-02  5.01E-02
33 AERS (U) 0             1.07E+00   1.067E+00   6.11E-01 [illegible] 1.39E+00 1.55E+00 1.63E+00  1.63E+00  1.55E+00  1.39E+00  1.11E+00  6.11E-01
34 AERO (U) 0             2.20E-02   2.205E-02   1.43E-02  2.30E-02  2.75E-02  3.01E-02  3.13E-02  3.13E-02  3.01E-02  2.75E-02  2.30E-02  1.43E-02
35 H2O  (I) 0.            1.90E+04   1.900E+04   1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04  1.90E+04

                                                                CELLS
                        ----------------------------------------------------------------------------------------------------------
                             1          2          3          4          5          6          7          8          9          10
     CELL DEPTHS (M)     1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03
     CELL WIDTHS (M)     4.96E+02   2.37E+02   1.79E+02   1.56E+02   1.47E+02   1.47E+02   1.56E+02   1.79E+02   2.37E+02   4.96E+02
CELL CENTERLINES (M)    -9.67E+02  -6.01E+02  -3.92E+02  -2.25E+02  -7.84E+01   7.84E+01   2.25E+02   3.92E+02   6.01E+02   9.67E+02

 CELL BOUNDARIES (M)  -1.21E+03 -7.19E+02 -4.82E+02 -3.03E+02 -1.47E+02  0.          1.47E+02  3.03E+02  4.82E+02  7.19E+02  1.21E+03
DIFFUSIVITIES (M2/S)   0.         4.02E+01  5.21E+01  5.63E+01  5.87E+01  0.          5.87E+01  5.63E+01  5.21E+01  4.02E+01  0.
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Figure 15 (Continued).

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 TIME= 1.00E+02 MIN.             PLUME WIDTH= 2.672E+03 M.     SIGMA Y= 6.679E+02 M.     WIND SPEED= 4.00E+00 M/SEC
FETCH= 2.41E+04 METERS           PLUME DEPTH= 1.243E+03 M.                                 KI FACTOR= 2.222E-01
AERS CONC. IN MICRO-G/M**3

                              PLUME     PLUME-                                               CELLS
  SPECIES        AMBIENT       AVE.      AMB       -------------------------------------------------------------------------------------------------------
                                                       1        2        3        4        5        6        7        8        9        10
 1 TRAC  (D) 0.              1.44E-03  1.442E-03   7.07E-04 1.48E-03 1.95E-03 2.25E-03 2.39E-03 2.39E-03 2.25E-03 1.95E-03 1.48E-03 7.07E-04
 2 TEST  (D) 1.00E+00 1.00E+00 -4.398E-14   1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
 3 NO2   (D) 3.40E-03 3.67E-03  2.737E-04   3.33E-03 3.68E-03 3.76E-03 3.81E-03 3.83E-03 3.83E-03 3.81E-03 3.76E-03 3.68E-03 3.33E-03
 4 NO    (D) 2.18E-04 2.26E-04  7.975E-06   2.22E-04 2.26E-04 2.29E-04 2.30E-04 2.31E-04 2.31E-04 2.30E-04 2.29E-04 2.26E-04 2.22E-04
 5 O3    (D) 9.63E-02 1.02E-01  5.939E-03   9.97E-02 1.03E-01 1.04E-01 1.05E-01 1.06E-01 1.06E-01 1.05E-01 1.04E-01 1.03E-01 9.97E-02
 6 NO3   (D) 0.       5.40E-05  5.405E-05   5.37E-05 5.42E-05 5.43E-05 5.43E-05 5.44E-05 5.44E-05 5.43E-05 5.43E-05 5.42E-05 5.37E-05
 7 CO    (D) 6.13E-01 6.13E-01  3.104E-04   6.13E-01 6.13E-01 6.13E-01 6.13E-01 6.13E-01 6.13E-01 6.13E-01 6.13E-01 6.13E-01 6.13E-01
 8 PAN   (D) 4.77E-03 5.10E-03  3.306E-04   4.92E-03 5.11E-03 5.22E-03 5.29E-03 5.33E-03 5.33E-03 5.29E-03 5.22E-03 5.11E-03 4.92E-03
 9 OLE   (D) 5.30E-03 5.14E-03 -1.624E-04   5.22E-03 5.13E-03 5.08E-03 5.05E-03 5.03E-03 5.03E-03 5.05E-03 5.08E-03 5.13E-03 5.22E-03
10 CARB  (D) 7.97E-02 8.00E-02  3.205E-04   7.97E-02 8.00E-02 8.02E-02 8.04E-02 8.04E-02 8.04E-02 8.04E-02 8.02E-02 8.00E-02 7.97E-02
11 PAR   (D) 3.36E-01 3.34E-01 -1.801E-03   3.35E-01 3.34E-01 3.34E-01 3.34E-01 3.34E-01 3.34E-01 3.34E-01 3.34E-01 3.34E-01 3.35E-01
12 ARO   (D) 1.02E-01 1.00E-01 -1.469E-03   1.01E-01 1.00E-01 1.00E-01 9.96E-02 9.95E-02 9.95E-02 9.96E-02 1.00E-01 1.00E-01 1.01E-01
13 SO2   (D) 1.94E-02 2.17E-02  2.348E-03   2.05E-02 2.18E-02 2.25E-02 2.29E-02 2.32E-02 2.32E-02 2.29E-02 2.25E-02 2.18E-02 2.05E-02
14 HNO3  (D) 0.       8.72E-06  8.722E-06   7.71E-06 8.90E-06 9.43E-06 9.69E-06 9.83E-06 9.83E-06 9.69E-06 9.43E-06 8.90E-06 7.71E-06
15 HSO4  (D) 0.       4.29E-08  4.293E-08   3.87E-08 4.42E-08 4.60E-08 4.69E-08 4.72E-08 4.72E-08 4.69E-08 4.60E-08 4.42E-08 3.87E-08
16 ETH   (D) 9.10E-03 9.02E-03 -7.864E-05   9.06E-03 9.02E-03 9.00E-03 8.98E-03 8.97E-03 8.97E-03 8.98E-03 9.00E-03 9.02E-03 9.06E-03
17 BZA   (D) 4.73E-04 4.94E-04  2.180E-05   4.83E-04 4.95E-04 5.01E-04 5.05E-04 5.07E-04 5.07E-04 5.05E-04 5.01E-04 4.95E-04 4.83E-04
18 O     (S) 0.       1.88E-10  1.883E-10   1.79E-10 1.86E-10 1.90E-10 1.92E-10 1.93E-10 1.93E-10 1.92E-10 1.90E-10 1.86E-10 1.79E-10
19 CRIG  (S) 0.       5.38E-09  5.385E-09   5.22E-09 5.39E-09 5.43E-09 5.45E-09 5.46E-09 5.46E-09 5.45E-09 5.43E-09 5.39E-09 5.22E-09
20 MCRG  (S) 0.       3.83E-09  3.837E-09   3.80E-09 3.83E-09 3.85E-09 3.86E-09 3.86E-09 3.86E-09 3.85E-09 3.85E-09 3.83E-09 3.80E-09
21 OH    (S) 0.       3.74E-08  3.739E-08   3.64E-08 3.73E-08 3.81E-08 3.84E-08 3.85E-08 3.85E-08 3.84E-08 3.81E-08 3.73E-08 3.64E-08
22 RAO2  (S) 0.       3.48E-07  3.481E-07   3.53E-07 3.48E-07 3.44E-07 3.42E-07 3.41E-07 3.41E-07 3.42E-07 3.44E-07 3.48E-07 3.53E-07
23 RBO2  (S) 0.       1.25E-06  1.251E-06   1.25E-06 1.25E-06 1.25E-06 1.25E-06 1.25E-06 1.25E-06 1.25E-06 1.25E-06 1.25E-06 1.25E-06
24 MEO2  (S) 0.       2.97E-05  2.978E-05   2.98E-05 2.98E-05 2.97E-05 2.97E-05 2.97E-05 2.97E-05 2.97E-05 2.97E-05 2.98E-05 2.98E-05
25 ACO3  (S) 0.       2.03E-05  2.038E-05   2.03E-05 2.03E-05 2.03E-05 2.03E-05 2.04E-05 2.04E-05 2.03E-05 2.03E-05 2.03E-05 2.03E-05
26 RO3   (S) 0.       1.58E-07  1.580E-07   1.48E-07 1.58E-07 1.65E-07 1.69E-07 1.71E-07 1.71E-07 1.69E-07 1.65E-07 1.58E-07 1.48E-07
27 Y     (S) 0.       3.13E-03  3.132E-03   3.15E-03 3.13E-03 3.12E-03 3.11E-03 3.11E-03 3.11E-03 3.11E-03 3.12E-03 3.13E-03 3.15E-03
28 X     (S) 0.       2.58E-09  2.587E-09   2.34E-09 2.59E-09 2.62E-09 2.64E-09 2.65E-09 2.65E-09 2.64E-09 2.62E-09 2.59E-09 2.34E-09
29 W     (S) 0.       1.41E-09  1.409E-09   1.39E-09 1.41E-09 1.42E-09 1.43E-09 1.43E-09 1.43E-09 1.43E-09 1.42E-09 1.41E-09 1.39E-09
30 H2O2  (U) 0.       9.72E-04  9.724E-04   5.43E-04 1.01E-03 1.27E-03 1.43E-03 1.51E-03 1.51E-03 1.43E-03 1.27E-03 1.01E-03 5.43E-04
31 CO2   (U) 0.       3.02E-03  3.017E-03   1.92E-03 3.15E-03 3.80E-03 4.17E-03 4.35E-03 4.35E-03 4.17E-03 3.80E-03 3.15E-03 1.92E-03
32 O2    (U) 0.       8.02E-02  8.020E-02   4.93E-02 8.35E-02 1.02E-01 1.13E-01 1.18E-01 1.18E-01 1.13E-01 1.02E-01 8.35E-02 4.93E-02
33 AERS  (U) 0.       1.03E+00  1.026E+00   5.84E-01 1.06E+00 1.34E+00 1.50E+00 1.57E+00 1.57E+00 1.50E+00 1.34E+00 1.06E+00 5.84E-01
34 AERO  (U) 0.       2.20E-02  2.203E-02   1.41E-02 2.30E-02 2.76E-02 3.03E-02 3.15E-02 3.15E-02 3.03E-02 2.76E-02 2.30E-02 1.41E-02
35 H2O   (I) 0.       1.90E+04  1.900E+04   1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04 1.90E+04

                                                                          CELLS
                                   -----------------------------------------------------------------------------------------------------
                                       1          2          3          4          5          6          7          8          9          10
       CELL DEPTHS (M)             1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03   1.24E+03
       CELL WIDTHS (M)             5.45E+02   2.61E+02   1.97E+02   1.72E+02   1.61E+02   1.61E+02   1.72E+02   1.97E+02   2.61E+02   5.45E+02
CELL CENTERLINES (M)              -1.06E+03  -6.61E+02  -4.32E+02  -2.47E+02  -8.07E+01   8.07E+01   2.47E+02   4.32E+02   6.61E+02   1.06E+03

 CELL BOUNDARIES (M)   -1.34E+03 -7.91E+02 -5.30E+02 -3.33E+02 -1.61E+02  0.          1.61E+02  3.33E+02  5.30E+02  7.91E+02  1.34E+03
DIFFUSIVITIES (M2/S)    0.        4.35E+01  5.64E+01  6.03E+01  6.35E+01  0.          6.35E+01  6.03E+01  5.64E+01  4.35E+01  0.
```

Figure 15 (Continued).

Reproduced from best available copy.

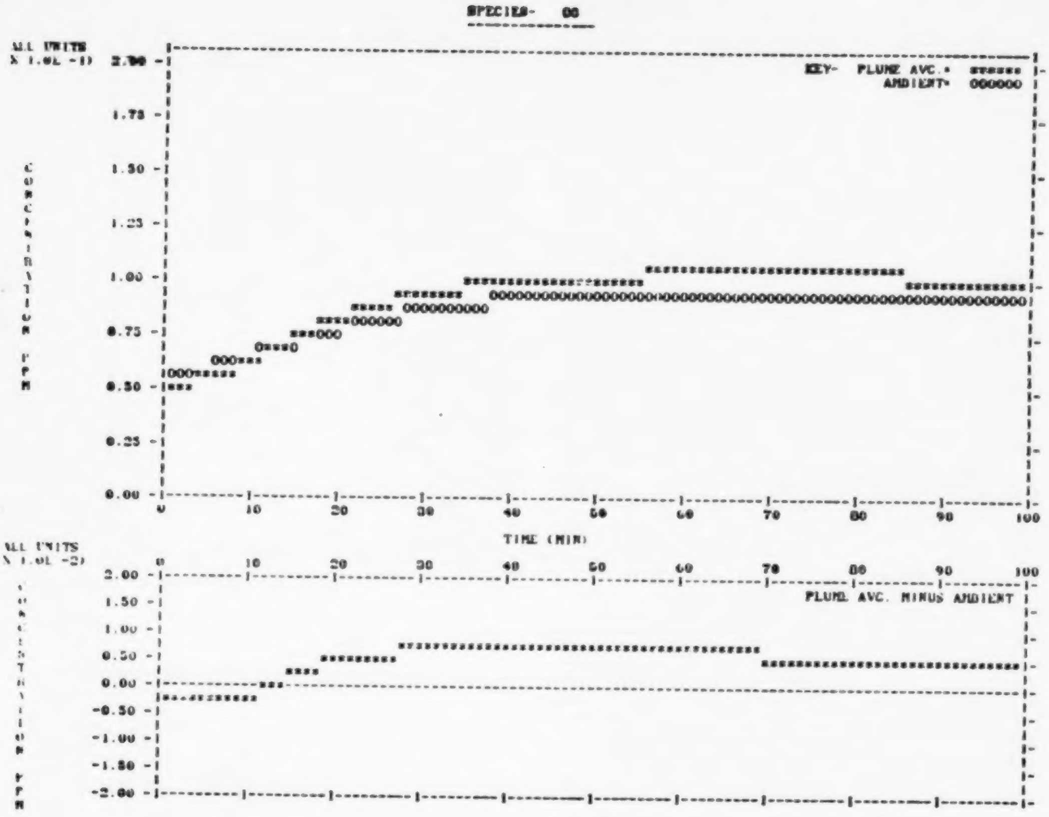

Figure 15 (Continued).

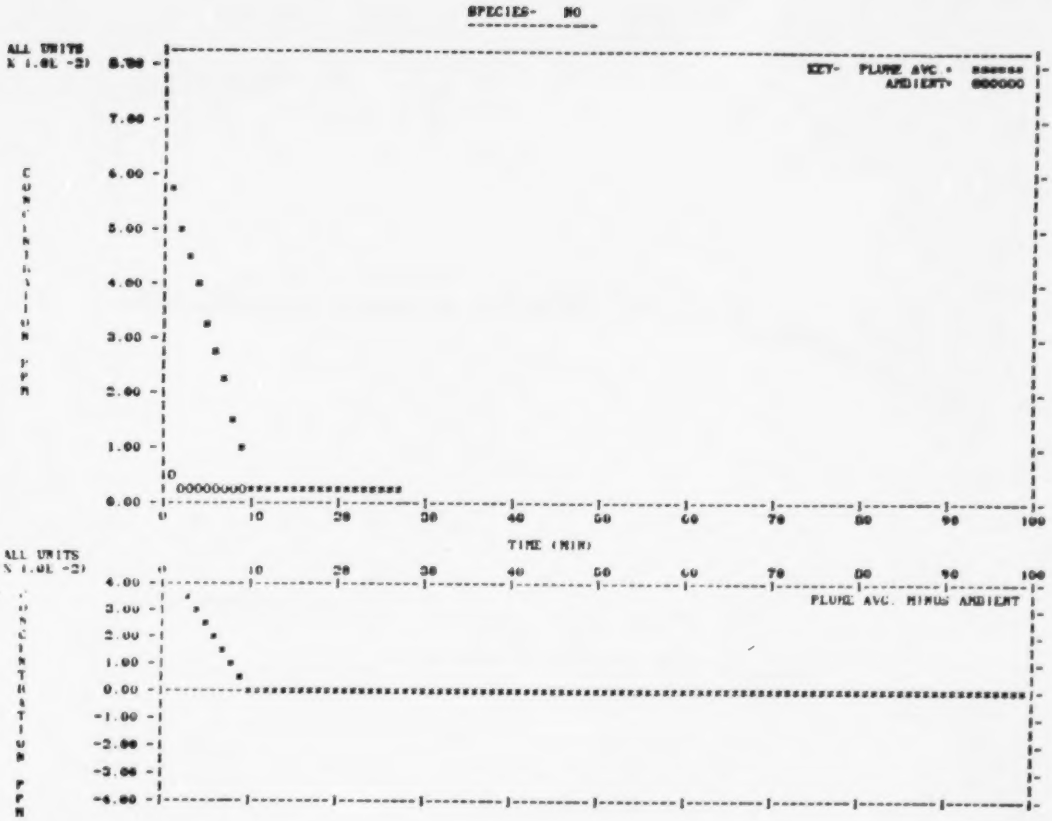

Figure 15 (Continued).

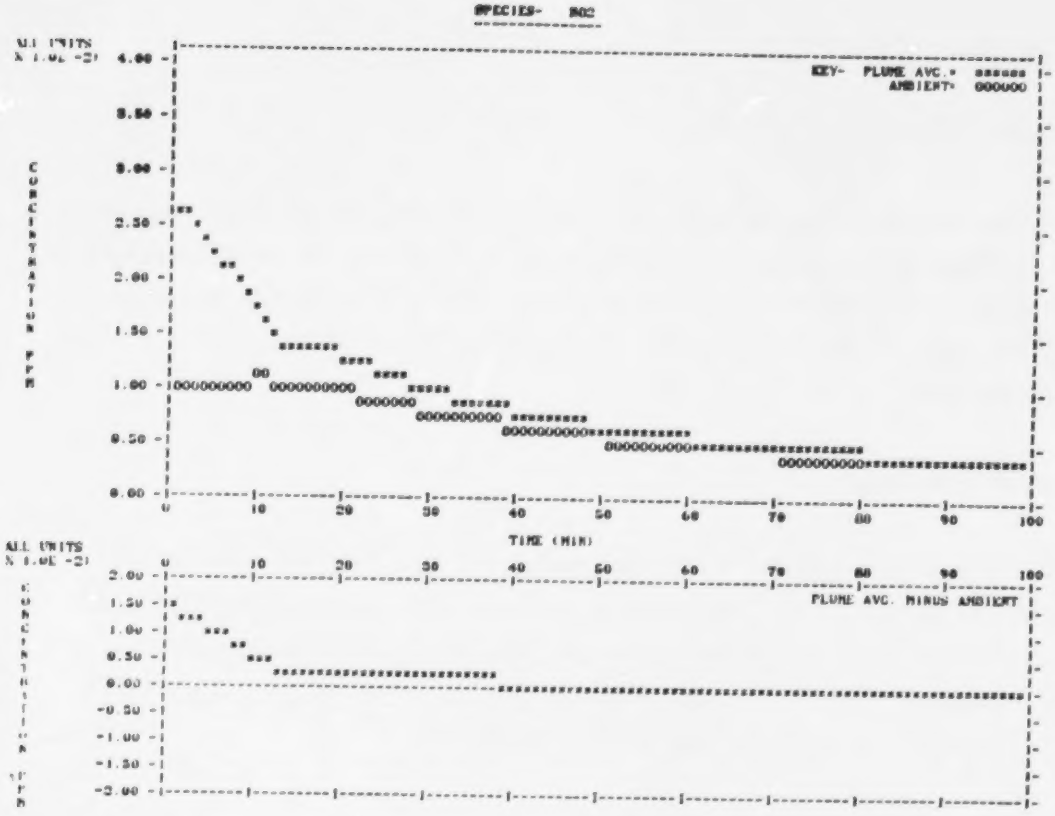

Figure 15 (Concluded).

4.0 COMPUTER USERS' NOTES

4.1 DIAGNOSTIC MESSAGES

At the present time, RPM-II contains six diagnostic messages that will aid in setting up and executing the program. After any of these messages are printed, the program run is terminated. Table 1 lists the message, the subroutine generating the message, the probable cause of the error, and the corrective action required of the user.

4.2 OPERATION GUIDE

Because of the complexity of the model and the limited applications of RPM-II to date, the entire spectrum of possible errors in executing the program has not been fully realized. Helpful tips on program and data set-up are discussed in this section with the intent of minimizing the number of attempts necessary to achieve a successful run.

4.2.1 Input of Initial and Ambient Concentrations

The input of initial and ambient concentrations may be a source of confusion to the inexperienced user. The program reads species concentrations in two parts of the input deck: Initial concentrations are read from subroutine CHEMIN, and ambient concentrations are read from METIN. The selection of initial concentrations for the model simulation depends on which type of simulation the user desires (whether MODE2=1, 2, or 3).

For a plume simulation only (MODE2=2), the user has two options for simulation initialization. The first option requires manually taking emissions input (mass/time), dividing by initial plume dimensions and wind speed (as indicated in the input deck), and adding these concentrations, where appropriate, to the ambient concentrations; these new concentrations are values entered as initial concentrations. This method

TABLE 1. RPM-II DIAGNOSTIC MESSAGES

Diagnostic Message	Subroutine	Probable Causes	Corrective Action Required
A. RPM-II CANNOT HANDLE MORE THAN ABC REACTIONS. JOB ABORTED.	CHEMIN	1. An error exists in the data card containing the variable NRXN.	1. Check data card for format error, eg. misalignment of columns, typographical errors, etc.
		2. The user is attempting to provide, as input, a greater number of reactions than RPM-II is capable of handling.	2. If user installs a chemical mechanism containing a greater number of reactions than MAXRCT, this variable must be redefined. MAXRCT is defined in the program segment labeled BLOCK DATA. NOTE: > Redefining MAXRCT may necessitate redimensioning certain variables in the program. > ABC = MAXRCT in the diagnostic message.
B. RPM-II CANNOT HANDLE MORE THAN ABC DIFFERENTIAL SPECIES. JOB ABORTED.	CHEMIN	1. An error exists in the data card containing the variable NDIF.	1. Check data card for format error, e.g. misalignment of columns, typographical errors, etc.
		2. The user is attempting to input a greater number of differential species than permitted by RPM-II.	2. If user installs a chemical mechanism containing a greater number of differential species than MAXDIF, this variable must be redefined. MAXDIF is defined in the program segment labeled BLOCK DATA. NOTE: > Redefining MAXDIF may necessitate re-dimensioning certain variables in the program. > ABC = MAXDIF in the diagnostic message.

TABLE 1 (Continued)

Diagnostic Message	Subroutine	Probable Causes	Corrective Action Required
C. RPM-II CANNOT HANDLE MORE THAN ABC SPECIES. JOB ABORTED.	CHEMIN	1. An error exists in the data card containing the variables NDIF, NSTS, NUNC, and NINT.	1. Check data card format error, eg. misalignment of columns, typographical errors, etc.
		2. The user is attempting to input a greater number of total species (NDIF+NSTS+NUNC+NINT) than RPM-II is capable of handling.	2. If user installs a chemical mechanism containing a greater number of total species than MAXSPC, this variable must be re-defined. MAXSPC is defined in the program segment labeled BLOCK DATA. NOTE: > Redefining MAXSPC may necessitate re-demensioning certain variables in the program. > ABC = MAXSPC in the diagnostic message.
D. SPECIES NAME, ABC NOT IN SPECIES LIST. JOB ABORTED.	CHEMIN	1. While reading the reactants and products, a variable name was encountered that did not match any variable names in the species list. The species list is the group of input cards containing initial concentrations.	1. Check for typographical errors in the reactions input and the initial concentrations input.
			2. Check to ensure there are no products or reactants whose names do not appear in the initial concentrations input (species list). NOTE: > ABC = name of species that could not be found in the initial concentrations input.

TABLE 1 (Concluded)

Diagnostic Message	Subroutine	Probable Causes	Corrective Action Required
E. JOB ABORT - SPECIES NAME (ABC) IS NOT IN SPECIES LIST.	METIN	1. While reading ambient concentrations, a variable name was encountered that did not match any variable names in the species list. The species list is the group of input cards containing initial concentrations.	1. Check for typographical errors in the ambient concentrations input and the initial concentrations input. 2. Check to ensure that there are no ambient concentrations whose names do not appear in the initial concentrations input (species list). NOTE: ABC = the name of the ambient species encountered that does not appear in the initial concentrations input.
F. POOR CONVERGENCE, NC=ABC, L=DEF, X=GHI, FX=JKL	CLLDIM	1. Error occurred while finding root to an equation in a secant method. Number of iterations exceeded maximum allowed.	1. Relax the convergence criteria, EPS is subroutine CLLDIM. EPS is defined in a data statement near the beginning of the subroutine. 2. Increase the maximum number of iterations allowed, N. N is defined in the same data statement as EPS, i.e., near the beginning of subroutine CLLDIM.

assumes that the plume contains all emissions from the primary point source at initialization time. Other (secondary) downwind point sources may be added to the plume automatically by inserting emissions data (read from SORCES) where appropriate.

The second option allows the user to avoid the task of manually specifying initial plume concentrations. It requires all initial concentrations (except TRAC) to be set to the values given in the ambient section. Then the primary emissions may be injected a short distance downwind by placing the emissions data in the SORCES section of the input deck. It is recommended (though not required) that plume dimensions at the primary injection distance be set equal to the initial dimensions to avoid dispersion of a plume containing only ambient concentrations. The tracer species (TRAC) need not be injected, so long as it is initially set to 1.0 and no premature dispersion is allowed. Note that this precaution was not followed in the Sample Output No. 3.

For combined ambient and plume simulation (MODE2=3), the program simulates ambients first, and then it uses these ambients as input to the plume phase. Initial concentrations (as read from CHEMIN) are used to initialize the simulation unless NFLAG=1. If NFLAG=1, the program looks to the initial ambient concentrations for initial values. This occurs because the plume phase of the simulation may be initialized in the manner of the first option discussed above. Either option of plume phase initialization is permitted, but if the primary emissions injection option is chosen, initial values should be set to ambient values and the parameter NFLAG becomes superfluous. NFLAG=1 merely causes the program to subtract ambient concentrations from the initial value before arranging the species in the Gaussian distribution for cell concentration initialization.

4.2.2 Initial Plume Dimensions

Initial plume dimensions should be no smaller than those dimensions found at a downwind distance of 100 meters. Dimensions may be determined from σ_y and σ_z curves for Pasquill stability types. If the automatic dispersion calculation option is elected (HDSOPT, VDSOPT=2, or both), then initial downwind distance should not be set any smaller than 100 meters. These precautions are necessary because initial concentrations of a too large value can cause excessive execution time during the early portion of the simulation.

4.2.3 Vertical Plume Depth

Vertical plume depth input can reflect vertical dispersion until the mixing layer is filled, as long as the limiting assumption of vertical concentration uniformity is borne in mind. It may also reflect changes in mixing depths.

4.2.4 Specification of Wind Speeds

If wind speed is constant throughout the model simulation, input of one set of variables is sufficient [i.e., WINDSP(1), WTIME(1)], but up to ten sets of variables [WINDSP(1), WTIME(1), ..., WINDSP(10), WTIME(10)] are permitted.

4.2.5 Specification of Plume Widths

If the user wishes to simulate ambient conditions only (MODE2=1), the width of the parcel* must be held constant. Therefore only one set of width variables is needed [XRAD(1), WIDTH(1)]. However, if the user has more than one set of variables for input, or the dispersion option HDSOPT=2 has been selected, the program will utilize only the first width value input (or calculated in the case of HDSOPT=2). For plume simulations, provisions allow for up to ten sets of width variables [i.e., XRAD(1), WIDTH(1), ..., XRAD(10), WIDTH(10)].

---

* The plume is considered a parcel under ambient simulations (MODE2=1).

4.2.6 Specification of Plume Depths

At the present time, ambient simulations (MODE2=1) are performed with the parcel* depth held constant. Under realistic conditions during the course of a day, the mixing depth typically increases in the morning and undergoes a sharp transition near sunset, so that this assumption is not strictly valid. Hence, the user may wish to specify a temporal structure in the parcel depth input [XMIX(J), DEPTH(J)]. A constant parcel* depth requires only one set of input values, although variable depths requiring up to ten sets of values can be specified.

4.2.7 Specification of Photolysis Rate Constants

The input of photolysis rate constants is similar to plume widths and depths [i.e., FACTK1(1), TK1(1), ..., FACTK1(10), TK1(10)]. The temporal variation of FACTK1 should be as smooth as possible because sharp transitions, approximating step functions, may be a source of instability to the numerical scheme. RPM-II is particularly sensitive to temporal variation when the rate change of FACTK1 is negative. See section 4.2.10 for further comments on this instability.

4.2.8 Specification of Ambient Concentrations

The user may wish to simulate a plume under background concentrations that have been measured or hypothesized. For this situation, MODE2 is set to 2 and time-varying ambient concentrations are set up in the data deck as described in Section 3.1.4.

4.2.9 Further Comments on Chemical Mechanism

As mentioned in Section 1.5.6, the chemical mechanism is a set of card images containing all the reaction steps and rate constants. There are, however, several cards in the computer code that contain information specifically geared toward the mechanism currently in use. These cards are indicated in the program listing in Appendix B. Basically, the cards refer to several photo-dissociation reaction steps whose rate constants are a function of the NO_2 photolysis rate constant. If a new mechanism is inserted, caution must be exercised to insure that the appropriate rate constants are associated with the correct reaction steps.

---

* The plume is considered a parcel under ambient simulations (MODE2=1).

4.2.10 Stability of Numerical Integration Scheme

As mentioned in Section 4.2.7, one possible source of instability in the numerical interpolation scheme arises because of encountering very steep gradients in some of the terms of the ODE system. This instability results in a permanent decrease in the integration step size and, hence, it results in prohibitively long execution times. The user is therefore cautioned against specifying a long execution time limit until the stability of the scheme is assured. Careful scrutiny of the input data is advised. One or two typographical errors could result in steep gradients and subsequent instability.

This instability is inherent in the present method of choosing integration step sizes. To eliminate the possibility of instabilities, a truly variable step formula must be implemented in the numerical solution technique.

REFERENCES

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2. Liu, M. K. A Simple Reactive Plume Model. EI75-12, Systems Applications, Incorporated, San Rafael, California, 1975.

3. Gear, C. W. Numerical Initial Value Problems in Ordinary Differential Equations. Prentice-Hall, Englewood Cliffs, N.J., 1971.

4. Whitten, G. A., and H. Hogo. Modeling of Simulated Photochemical Smog with Kinetic Mechanisms. EF78-121, Systems Applications, Incorporated, San Rafael, California, 1979.

5. Hecht, T. A., J. H. Seinfeld, and M. C. Dodge. Further Development of a Generalized Kinetic Mechanism for Photochemical Smog. Environ. Sci. Technol., Vol. 8, pp. 327-339, 1974.

6. Hindmarsh, A. C. Linear Multistep Methods for Ordinary Differential Equations: Method Formulations, Stability, and the Methods of Nordsieck and Gear. Lawrence Livermore Laboratory, Report No. UCRL-51186, Rev. 1, March 1972.

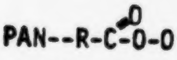
APPENDIX A

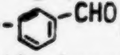
THE CARBON-BOND MECHANISM USED WITH THE REACTIVE PLUME MODEL

APPENDIX A

THE CARBON-BOND MECHANISM IN THE REACTIVE PLUME MODEL

1. THE CARBON-BOND SPECIES

- PAN--$R\text{-}\overset{O}{C}\text{-}O\text{-}O\ NO_2$: R is principally $CH_3\cdot$; mass balance in the Carbon-Bond Mechanism (CBM) assumes that R is $CH_3\cdot$.
- OLE--$HCH{=}CH_2$: reacts with the propylene rate constant.
- CARB--HCHO: reacts as either formaldehyde or higher aldehydes depending on parameter α.
- PAR--CH_4: reacts as average paraffin or is brought in by X for mass balance.
- ARO-- : reacts as substituted aromatic (e.g., toluene).
- ETH--C_2H_4: treated explicitly as ethylene.

BZA--: minor compound in aromatics chemistry (mostly benzaldehyde).

2. THE CARBON-BOND MECHANISM

The CBM (Whitten and Hogo, 1979[2]) can be represented in tabular format, as follows:

Reaction	Rate constant at 298K* ($ppm^{-1}min^{-1}$)	Activation energy (K)
$NO_2 + h\nu \rightarrow NO + O$	Experimental†	--
$O + O_2 + M \rightarrow O_3 + M$	2.1×10^{-5}§	--
$O_3 + NO \rightarrow NO_2 + O_2$	23.9	1,450
$O_3 + NO_2 \rightarrow NO_3 + O_2$	4.8×10^{-2}	2,450
$O + NO_2 \rightarrow NO + O_2$	1.34×10^{4}	--
$O_3 + OH \rightarrow HO_2 + O_2$	7.7×10^{1}	1,000
$O_3 + HO_2 \rightarrow OH + 2O_2$	5.0	1,525
$NO_2 + OH \rightarrow HNO_3$	1.4×10^{4}	--
$CO + OH \xrightarrow{O_2} HO_2 + CO_2$	4.4×10^{2}	--
$NO + NO + O_2 \rightarrow 2NO_2$	1.5×10^{-4}	--
$NO_3 + NO \rightarrow 2NO_2$	2.8×10^{4}	--
$NO_3 + NO_2 + H_2O \rightarrow 2HNO_3$	$(k_{N_2O_5} + H_2O) \times 311$***	-10,600
$HO_2 + NO \rightarrow NO_2 + OH$	1.2×10^{4}	--
$HO_2 + HO_2 \rightarrow$	1.5×10^{4}	--
$PAR + O \rightarrow MEO_2 + OH$	2×10^{1}	--
$PAR + OH \rightarrow MEO_2$	1.5×10^{3}	--
$OLE + O \rightarrow MEO_2 + ACO_3 + X$	2.7×10^{3}	--
$OLE + O \rightarrow CARB + PAR$	2.7×10^{3}	--
$OLE + OH \rightarrow RAO_2$	4.2×10^{4}	--
$OLE + O_3 \rightarrow CARB + CRIG$	8×10^{-3}	--
$OLE + O_3 \rightarrow CARB + MCRG + X$	8×10^{-3}	--
$ETH + O \rightarrow MEO_2 + HO_2 + CO$	6×10^{2}	--
$ETH + O \rightarrow CARB + PAR$	6×10^{2}	--

Reaction	Rate constant at 298K ($ppm^{-1} min^{-1}$)	Activation energy (K)
$ETH + OH \rightarrow RBO_2$	1.2×10^4	--
$ETH + O_3 \rightarrow CARB + CRIG$	2.4×10^{-3}	
$ACO_3 + NO \rightarrow NO_2 + MEO_2 + CO_2$	3.8×10^3	--
$RBO_2 + NO \rightarrow NO_2 + 2\ CARB + HO_2$	1.2×10^4	--
$RAO_2 + NO \rightarrow NO_2 + 2\ CARB + HO_2$	1.2×10^4	--
$MEO_2 + NO \rightarrow NO_2 + CARB + MEO_2 + X$	$(1.2 \times 10^4)(A-1)/A$**	--
$MEO_2 + NO \rightarrow NO_2 + CARB + HO_2$	$(1.2 \times 10^4)/A$**	--
$MEO_2 + NO \rightarrow$ Nitrate	5×10^2	--
$RBO_2 + O_3 \rightarrow 2\ CARB + HO_2$	5.0	--
$RAO_2 + O_3 \rightarrow 2\ CARB + HO_2$	2×10^2	--
$MEO_2 + O_3 \rightarrow CARB + HO_2$	5.0	--
$CARB + OH \rightarrow \alpha(HO_2 + CO) + (1 - \alpha)(ACO_3 + X)$	$(2.4 - \alpha) \times 10^4$	--
$CARB + h\nu \rightarrow CO$	αk_f*††	--
$CARB + h\nu \rightarrow (1 + \alpha)HO_2 + (1 - \alpha)(MEO_2 + X) + CO$	$\left(\frac{\alpha + 1}{2}\right)k_f$*††	--
$X + PAR \rightarrow$	1×10^5	--
$ACO_3 + NO_2 \rightarrow PAN$	2×10^3	--
$PAN \rightarrow ACO_3 + NO_2$	2.8×10^{-2}†	12,500
$ACO_3 + HO_2 \rightarrow$	4×10^3	--
$MEO_2 + HO_2 \rightarrow$	4×10^3	--
$CRIG + NO \rightarrow NO_2 + CARB$	1.2×10^4	--
$CRIG + NO_2 \rightarrow NO_3 + CARB$	8×10^3	--
$CRIG + CARB \rightarrow$ Ozonide	2×10^3	--
$MCRG + NO \rightarrow NO_2 + CARB + PAR$	1.2×10^4	--
$MCRG + NO_2 \rightarrow NO_3 + CARB + PAR$	8×10^3	--

Reaction	Rate constant at 298K ($ppm^{-1}min^{-1}$)	Activation energy (K)
MCRG + CARB → Ozonide	2×10^{3}	--
CRIG → CO	$6.7 \times 10^{2\dagger}$	--
CRIG → Stable Products	$2.4 \times 10^{2\dagger}$	--
CRIG → $2HO_2$ + CO_2	$9 \times 10^{1\dagger}$	--
MCRG → Stable Products	$1.5 \times 10^{2\dagger}$	--
MCRG → MEO_2 + OH + CO	$3.4 \times 10^{2\dagger}$	--
MCRG → MEO_2 + HO_2 + CO_2	$4.25 \times 10^{2\dagger}$	--
MCRG → CARB + 2HO + CO	$8.5 \times 10^{1\dagger}$	--
ARO + OH → ARPI + ARPI + ARPI + HO_2	6×10^{3}	--
ARO + OH → HO_2 + BZA + X	1.6×10^{3}	--
ARO + OH → OH + BZA + W	1.5×10^{4}	--
W + CARB	1.0×10^{5}	--
ARPI + NO → NO + CARB + PAR	30	--
ARPI + NO → NO_2 + AEROSOL	15	--
ARPI + NO_3 → CARB + CARB	3.5×10^{4}	--
ARPI + O_3 → Aerosol	0.6	--
BZA + OH → HO_2 + ARPI + ARPI + ARPI + CO	10^{4}	--
BZA → MeO_2 + HO_2 + ARPI + ARPI + ARPI	$K_{BZA}{}^{\S\S}$	--

---

* The rate constants shown are as used to model eleven experiments at UCR that used mixes of seven hydrocarbons. For that study the default values, α = 0.5 and A = 1.3, were used.

† Units of min^{-1}.

§ Units of $ppm^{-2}min^{-1}$.

** A = A is the average number of $RO_2^{\cdot}$-type radicals generated from a hydrocarbon between attack by OH· and generation of $HO_2^{\cdot}$

†† α is the fraction of total aldehydes that represents formaldehyde and ketones. k_f is the carbonyl photolysis rate constant.

§§ $K_{BZA} \cong 0.036 \times k_{NO_2} + h\nu$

*** Equals 5×10^{-6} ppm^{-1} min^{-1} for UCR simulations.

APPENDIX B
PROGRAM LISTING

```
PROGRAM RPM2B      76/76    OPT=1                    FTN 4.6+459        08/10/79  15.54.34       PAGE     1

      C                                                                    00100
      C   ************************************                             00110
      C   * REACTIVE PLUME MODEL, VERSION II *                             00120
      C   ************************************                             00130
      C                                                                    00140
      C     CURRENT VERSION UPDATED 5/30/79                                00150
      C                                                                    00160
      C     DEVELOPED BY-  SYSTEMS APPLICATIONS, INC.                      00170
      C                    950 NORTHGATE DRIVE                             00180
      C                    SAN RAFAEL, CA. 94903                           00190
      C                                                                    00200
      C     ANY QUESTIONS SHOULD BE DIRECTED TO MEI-KAO LIU OR             00210
      C     DOUGLAS STEWART AT (415) 472-4011                              00220
      C                                                                    00230
            PROGRAM RPM2B(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE9)     00240
      C                                                                    00250
            LEVEL 2, BL,BU                                                 00260
      C                                                                    00270
            COMMON /LVL2/ BL(16400),BU(16000)                              00280
            COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS      00290
            COMMON /INPUT4/ MODE1,MODE2,MODE3                              00300
            COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF            00310
            COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                       00320
            COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT 00330
            COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)         00340
            INTEGER STPCOD                                                 00350
      C                                                                    00360
            CALL INPUT                                                     00370
      C                                                                    00380
            KAMBNT=1                                                       00390
            IF(MODE2.EQ.2) KAMBNT=2                                        00400
            IPHASE=1                                                       00410
            IF(MODE3.EQ.3) IPHASE=3                                        00420
      C                                                                    00430
        100 CALL INITLZ(STPCOD)                                            00440
      C                                                                    00450
        200 CALL CHECK(STPCOD)                                             00460
      C                                                                    00470
            IF(STPCOD.EQ.0) GO TO 250                                      00480
            IF(MODE2.EQ.1) CALL OUTPUT(4)                                  00490
            IF(KAMBNT.EQ.1) CALL OUTPUT(3)                                 00500
            IF(KAMBNT.EQ.2) CALL OUTPUT(4)                                 00510
            KAMBNT=2                                                       00520
            GO TO 100                                                      00530
      C                                                                    00540
        250 CALL DIFSUB(NDIF,NC5,MHALF,N,TIME,H,HMIN,HMAX,EPS,MF,MCODE     00550
           1,KFLAG,JSTART,BL,BU,Y,C,HALF)                                  00560
      C                                                                    00570
            CALL UNCOUP                                                    00580
      C                                                                    00590
            CALL UPDATE                                                    00600
      C                                                                    00610
            GO TO 200                                                      00620
      C                                                                    00630
            END                                                            00640
      SUBROUTINE INPUT                                                  00650
C                                                                       00660
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF, 00670
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    00680
     2,MAXSTAB                                                          00690
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         00700
      COMMON /INPUT2/ XMIX(10),DEPTH(10),XRAD(10),WIDTH(10),TK1(10)     00710
     1        ,FACTK1(10),WINDSP(10),WTIME(10)                          00720
      COMMON /INPUT3/ NMIX,NRAD,NKIT,NAMB,NWIND                         00730
      COMMON /INPUT4/ MODE1,MODE2,MODE3                                 00740
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  00750
     1,SRK(99)                                                          00760
      COMMON /CHEM2/ KRXN(99,40),KCOF(99,40),KPRD(4,99),KRCT(4,99)      00770
      COMMON /SAVEIT/ ISAVE                                             00780
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              00790
      COMMON /AMBNT3/ YAMBIN(40,10),AMBT(10)                            00800
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           00810
     1,UNCOLD(40,10)                                                    00820
      COMMON /GEOM3/ DEFNW,FACTR                                        00830
      COMMON /TIME/ TINCR1,TINCR2,TCNT1,TCNT2                           00840
      COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                          00850
      COMMON /MISC/ XBEG,XEND,TBEG,TEND,IOUT,DCOUNT,DIST(10),KDIST      00860
C                                                                       00870
      DIMENSION INCOM(20)                                               00880
      LOGICAL HALF                                                      00890
C                                                                       00900
C READ SIMULATION CONTROL CARDS                                         00910
C                                                                       00920
      READ(NIN,1000) (INCOM(I),I=1,20)                                  00930
      READ(NIN,1001) MODE1,MODE2,MODE3                                  00940
      READ(NIN,1005) HALF                                               00950
      READ(NIN,1001) NCELLS,ISAVE                                       00960
      READ(NIN,1002) TINCR1                                             00970
      READ(NIN,1002) XBEG,XEND                                          00980
      READ(NIN,1002) TBEG,TEND                                          00990
      READ(NIN,1002) DEFNW,FACTR                                        01000
      READ(NIN,1002) HSTART,HMIN,HMAX,EPS,TOL                           01010
      READ(NIN,1001) IOUT,NDIST                                         01020
      IF(IOUT.EQ.1) GO TO 10                                            01030
      READ(NIN,1002) (DIST(I),I=1,NDIST)                                01040
   10 CONTINUE                                                          01050
C                                                                       01060
C****** ALL INPUT OPTIONS TO BE DEVELOPED IN THIS ROUTINE               01070
C                                                                       01080
C                                                                       01090
C INPUT OUTPUT                                                          01100
C                                                                       01110
      WRITE(NOUT,5000) (INCOM(I),I=1,20)                                01120
      WRITE(NOUT,5001) MODE1,MODE2,MODE3                                01130
      WRITE(NOUT,6000)                                                  01140
      IF(ISAVE.EQ.0) WRITE(NOUT,5002)                                   01150
      IF(ISAVE.EQ.1) WRITE(NOUT,5003)                                   01160
      IF(IOUT.EQ.1) WRITE(NOUT,5004) TINCR1                             01170
      IF(IOUT.EQ.2) WRITE(NOUT,5013) (DIST(I),I=1,NDIST)                01180
      WRITE(NOUT,5005) XBEG,TEND,XEND,TBEG                              01190
      WRITE(NOUT,5006) NCELLS                                           01200
      IF(MODE3.EQ.3) GO TO 600                                          01210
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            NCELLS=NCELLS/2                                                    01220
            WRITE(NOUT,5067) NCELLS                                            01230
            GO TO 605                                                          01240
        600 WRITE(NOUT,5008)                                                   01250
        605 WRITE(NOUT,5009) DEFNW,FACTR                                       01260
            WRITE(NOUT,5010) HSTART,HMIN,HMAX,TOL,EPS                          01270
            WRITE(NOUT,5011) HALF                                              01280
            WRITE(NOUT,5012)                                                   01290
      C                                                                        01300
            CALL CHEMIN                                                        01310
            CALL SORCES                                                        01320
            CALL METIN                                                         01330
      C                                                                        01340
      C     OUTPUT TO DISK IF ISAVE=1                                          01350
      C                                                                        01360
            IF(ISAVE.NE.1) RETURN                                              01370
            WRITE(NDISK) (INCOM(I),I=1,20)                                     01380
            WRITE(NDISK) MODE1,MODE2,MODE3,HALF,NCELLS,ISAVE,TINCR1            01390
           1,TINCR2,XBEG,XEND,TBEG,TEND,DEFNW,FACTR,HSTART,HMIN,HMAX           01400
           2,EPS,TOL,IOUT,NDIST                                                01410
            IF(IOUT.EQ.2) WRITE(NDISK) (DIST(I),I=1,NDIST)                     01420
            RETURN                                                             01430
      C                                                                        01440
      C INPUT FORMATS                                                          01450
      C                                                                        01460
       1000 FORMAT(20A4)                                                       01470
       1001 FORMAT(3I4)                                                        01480
       1002 FORMAT(8F10.0)                                                     01490
       1005 FORMAT(L2)                                                         01500
      C                                                                        01510
      C OUTPUT FORMATS                                                         01520
      C                                                                        01530
       5000 FORMAT(1H1,20A4,/1H0)                                              01540
       5001 FORMAT(1H0,17HSIMULATION MODES-,13X,6HMODE1=,I2,/31X               01550
           1,6HMODE2=,I2,/31X,6HMODE3=,I2,/1H0,10X                             01560
           2,27HWHERE...  MODE1= 1 -SINGLE ,16HPLUME SIMULATION                01570
           3,/28X,28H2 -MULTIPLE PLUME SIMULATION,/1H0                         01580
           4,20X,52HMODE2= 1 -AMBIENT SIMULATION ONLY (EG. SMOG CHAMBER)       01590
           5,/28X,48H2 -PLUME SIMULATION ONLY (AMBIENT CONCENTRATIONS          01600
           6,15H MUST BE INPUT),/28X,21H3 -AMBIENT SIMULATION                  01610
           7,22H FOLLOWED BY PLUME RUN,/1H0,20X,                               01620
           860HMODE3= 1 -NEAR SOURCE SIMULATION (ELLIPTICAL CROSS SECTIONS)    01630
           9,/28X,36H2 -NEAR SOURCE MERGING TO FAR SOURCE                      01640
           1,/28X,53H3 -FAR SOURCE SIMULATION (VERTICALLY UNIFORM CONCEN       01650
           2,17HTRATIONS ASSUMED),/1H0)                                        01660
       6000 FORMAT(1H0,9X,40H-NOTE-   1) MODE1=2 CAN ONLY OPERATE WITH         01670
           1,8H MODE3=3,/18X,37H2) MODE1=2 NOT AVAILABLE AT THIS TIME          01680
           2,/18X,35H3) MODE3=1+2 ALSO NOT YET AVAILABLE,/1H0)                 01690
       5002 FORMAT(1H0,33HOUTPUT IS NOT TO BE SAVED ON DISK)                   01700
       5003 FORMAT(1H0,36HOUTPUT IS TO BE SAVED ON DISK- TAPE9)                01710
       5004 FORMAT(1H0,26HPRINTED OUTPUT INTERVAL IS,1X,1PE10.3,5H MIN.)       01720
       5013 FORMAT(1H0,42HPRINTED OUTPUT GIVEN AT FOLLOWING DOWNWIND           01730
           1,14H DISTANCES (M),/1H0,10(1PE10.3))                               01740
       5005 FORMAT(1H0,27HMODEL SIMULATION BEGINS AT ,1PE10.3                  01750
           1,20H METERS AND ENDS AT ,1PE10.3,9H MIN. OR ,1PE10.3               01760
           2,32H METERS, WHICH EVER OCCURS FIRST,/28X,1PE10.3,5H MIN.)         01770
       5006 FORMAT(1H0,47HPLUME PARAMETERS    1) NO. OF CELLS (RECTANGULAR     01780
           1,16H APPROXIMATION)=,I2)                                                01790
      5007 FORMAT(20X,44H2) NO. OF CELLS (ELLIPTICAL APPROXIMATION)=                01800
           1,I2)                                                                    01810
      5008 FORMAT(20X,44H2) NO. OF CELLS (ELLIPTICAL APPROXIMATION)=                01820
           1,15H NOT APPLICABLE)                                                    01830
      5009 FORMAT(20X,45H3) TOTAL PLUME WIDTH (HEIGHT) IN MULTIPLES OF              01840
           1,19H SIGMA-Y (SIGMA-Z)=,F5.2,/20X,19H4) LENGTH SCALE FOR                01850
           2,33H DIFFUSION ACROSS PLUME BOUNDARY=,1X,F4.1,11H X WIDTH OF            01860
           3,11H OUTER CELL,/1H0)                                                   01870
      5010 FORMAT(1H0,41HNUMERICAL CONTROLS 1) STARTING TIME STEP=                  01880
           1,1PE10.3,/20X,21H2) MINIMUM TIME STEP=,1X,1PE10.3                       01890
           2,/20X,21H3) MAXIMUM TIME STEP=,1X,1PE10.3,/20X                          01900
           3,40H4) TOLERANCE (STEADY-STATE CALCULATION)=,1X,1PE10.3                 01910
           4,/20X,40H5) RELATIVE ERROR BOUND (ODE SOLVER)    =,1X                   01920
           5,1PE10.3,/1H0)                                                          01930
      5011 FORMAT(1H0,35HHALF OPTION (FOR SYMMETRIC PLUME) -,L3,/1H0)               01940
      5012 FORMAT(48H0NOTE- SULFATE AEROSOL (AERS) CONCENTRATIONS ARE               01950
           1,41H EXPRESSED IN MICRO-GRAMS PER METER CUBED)                          01960
C                                                                                   01970
           END                                                                      01980
      SUBROUTINE CHEMIN                                                 01990
C                                                                       02000
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         02010
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  02020
     1,SRK(99)                                                          02030
      COMMON /CHEM2/ KRXN(99,40),KCOF(99,40),KPRD(4,99),KRCT(4,99)      02040
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           02050
     1,UNCOLD(40,10)                                                    02060
      COMMON /SAVEIT/ ISAVE                                             02070
      COMMON /SINDEX/ IAERS,L1,L2,L4                                    02080
      COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            02090
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,  02100
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    02110
     2,MAXSTAB                                                          02120
      DIMENSION NPRD(99),NPRT(4),CHMCOM(20)                             02130
C                                                                       02140
      READ(NIN,1000) (CHMCOM(I),I=1,20)                                 02150
      READ(NIN,1001) NRXN,NDIF,NSTS,NUNC,NINT,NFLW                      02160
C                                                                       02170
C TEST REACTION COUNT                                                   02180
C                                                                       02190
      IF(NRXN.LE.MAXRXN) GO TO 10                                       02200
      WRITE(NOUT,2000) MAXRXN                                           02210
      GO TO 900                                                         02220
C                                                                       02230
C SET SPECIES NAME FLAG AND READ REACTIONS                              02240
C                                                                       02250
   10 LFLAG=0                                                           02260
      DO 15 K=1,NRXN                                                    02270
      READ(NIN,1002) (NMRC(J,K),J=1,MAXRCT),                            02280
     +     (COEFF(J,K),NMPD(J,K),J=1,MAXPRD),SRK(K)                     02290
   15 CONTINUE                                                          02300
C                                                                       02310
C TEST NUMBER OF DIFFERENTIAL SPECIES                                   02320
C                                                                       02330
      IF(NDIF.LE.MAXDIF) GO TO 20                                       02340
      WRITE(NOUT,2001) MAXDIF                                           02350
      GO TO 900                                                         02360
C                                                                       02370
C SET AND TEST TOTAL NUMBER OF SPECIES                                  02380
C                                                                       02390
   20 NTOT=NDIF+NSTS+NUNC+NINT                                          02400
      IF(NTOT.LE.MAXSPC) GO TO 30                                       02410
      WRITE(NOUT,2002) MAXSPC                                           02420
      GO TO 900                                                         02430
C                                                                       02440
C READ SPECIES CARDS                                                    02450
C                                                                       02460
   30 READ(NIN,1003) (NAME(J),YY(J),NFLAG(J),J=1,NTOT)                  02470
C                                                                       02480
C CLEAR REACTION POINTERS AND FILL IN SPECIES TYPE ARRAY                02490
C                                                                       02500
      DO 60 K=1,NTOT                                                    02510
      IF(NAME(K).EQ.4HAERS) IAERS=K                                     02520
      STYPE(K)=1HD                                                      02530
      IF(K.GT.NDIF) STYPE(K)=1HS                                        02540
      IF(K.GT.NDIF+NSTS) STYPE(K)=1HU                                   02550
      IF(K.GT.NDIF+NSTS+NUNC) STYPE(K)=1HI
      DO 60 J=1,NRXN
      KRXN(J,K)=0
   60 KCOF(J,K)=0
      YY(IAERS)=YY(IAERS)/3500.
C
C CLEAR SPECIES POINTERS
C
      DO 90 K=1,NRXN
      DO 70 J=1,MAXRCT
   70 KRCT(J,K)=0
      DO 80 J=1,MAXPRD
   80 KPRD(J,K)=0
   90 CONTINUE
C
C IDENTIFY REACTANT SPECIES -- FLAG IF MISSING
C
      DO 190 M=1,NRXN
      DO 130 L=1,MAXRCT
      NTEST=NMRC(L,M)
      IF(NTEST.EQ.JBLANK) GO TO 140
      DO 110 K=1,NTOT
      IF(NTEST.EQ.NAME(K)) GO TO 115
  110 CONTINUE
      WRITE(NOUT,2003) NTEST
      LFLAG=1
      GO TO 130
C
C FILL IN REACTION AND SPECIES POINTERS AND COUNTERS
C
  115 KRCT(L,M)=K
      DO 120 J=1,MAXRXN
      IF(KRXN(J,K).EQ.0) GO TO 125
  120 CONTINUE
  125 KRXN(J,K)=M
      KCOF(J,K)=-1
  130 CONTINUE
C
C IDENTIFY PRODUCT SPECIES -- FLAG IF MISSING
C
  140 DO 170 L=1,MAXPRD
      NTEST=NMPD(L,M)
      IF(NTEST.EQ.JBLANK) GO TO 180
      DO 150 K=1,NTOT
      IF(NTEST.EQ.NAME(K)) GO TO 155
  150 CONTINUE
      WRITE(NOUT,2003) NTEST
      LFLAG=1
      GO TO 170
C
C FILL IN REACTION AND SPECIES POINTERS AND COUNTERS
C
  155 KPRD(L,M)=K
      DO 160 J=1,MAXRXN
      IF(KRXN(J,K).EQ.0) GO TO 165
  160 CONTINUE
  165 KRXN(J,K)=M
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      KCOF(J,K)=L                                                       03130
  170 CONTINUE                                                          03140
C                                                                       03150
C SAVE NUMBER OF PRODUCT SPECIES FOR THIS REACTION                      03160
C                                                                       03170
      L=MAXPRD+1                                                        03180
  180 NPRD(M)=L-1                                                       03190
  190 CONTINUE                                                          03200
C                                                                       03210
C OUTPUT FROM CHEMIN                                                    03220
C                                                                       03230
      WRITE(NOUT,5000) (CHMCOM(I),I=1,20)                               03240
      WRITE(NOUT,5001) NRXN,NDIF,NSTS,NUNC,NINT,NFLW                    03250
      WRITE(NOUT,5002)                                                  03260
      WRITE(NOUT,5003) (I,NAME(I),STYPE(I),I=1,NTOT)                    03270
      WRITE(NOUT,5004)                                                  03280
      DO 200 M=1,NRXN                                                   03290
      NPRD9=NPRD(M)                                                     03300
      DO 205 J=1,MAXRCT                                                 03310
      K=MAXRCT-J+1                                                      03320
      NPRT(J)=NMRC(K,M)                                                 03330
  205 CONTINUE                                                          03340
  200 WRITE(NOUT,5005) M,SRK(M),(NPRT(J),J=1,MAXRCT),                   03350
     +                 (COEFF(J,M),NMPD(J,M),J=1,NPRD9)                 03360
      IF(LFLAG.EQ.1) GO TO 900                                          03370
C                                                                       03380
C OUTPUT TO DISK IF ISAVE=1                                             03390
C                                                                       03400
      IF(ISAVE.NE.1) RETURN                                             03410
      WRITE(NDISK) (CHMCOM(I),I=1,20)                                   03420
      WRITE(NDISK) NRXN,NDIF,NSTS,NUNC,NINT,NFLW                        03430
      WRITE(NDISK) (I,NAME(I),I=1,NTOT)                                 03440
      WRITE(NDISK) (M,SRK(M),(NMRC(J,M),J=1,MAXRCT),                    03450
     +              (COEFF(J,M),NMPD(J,M),J=1,MAXPRD),M=1,NRXN)         03460
      RETURN                                                            03470
C                                                                       03480
C INPUT FORMATS                                                         03490
C                                                                       03500
 1000 FORMAT(20A4)                                                      03510
 1001 FORMAT(20I4)                                                      03520
 1002 FORMAT(4(A4,1X),4(F6.0,A4),F10.0)                                 03530
 1003 FORMAT(A4,1X,F10.0,I2,63X)                                        03540
C                                                                       03550
C OUTPUT FORMATS                                                        03560
C                                                                       03570
 5000 FORMAT(1H1,20A4)                                                  03580
 5001 FORMAT(/1H0,19HNUMBER OF REACTIONS,20X                            03590
     1,1H-,I4,/1X,34HNUMBER OF DIFFERENTIAL SPECIES (D),5X,1H-,I4,/1X   03600
     2,34HNUMBER OF STEADY-STATE SPECIES (S),5X,1H-,I4,/1X              03610
     3,31HNUMBER OF UNCOUPLED SPECIES (U),8X,1H-,I4,/1X                 03620
     4,40HNUMBER OF INERT OR CONSTANT SPECIES (I)-,I4,/1X               03630
     5,27HNUMBER OF ENTRAINED SPECIES,12X,1H-,I4,/1H0)                  03640
 5002 FORMAT(3X,4(3(7HSPECIES,2X),6X),/4X,4(3HNO.,6X,4HNAME             03650
     1,5X,4HTYPE,11X),/1H0)                                             03660
 5003 FORMAT(4(4X,I2,7X,A4,6X,A1,9X))                                   03670
 5004 FORMAT(1H0,/58X,18HCHEMICAL REACTIONS,/1H0,33X                    03680
     1,11HRATE CONST.,8X,9HREACTANTS,10X,8HPRODUCTS,/1H0)               03690
 5005 FORMAT(31X,I3,1PE11.3,4(1X,A4),1H=,4(0PF6.2,1X,A4))
C
C ERROR FORMATS
C
 2000 FORMAT(31H0RPM-II CANNOT HANDLE MORE THAN,I3
     1,23H REACTIONS. JOB ABORTED)
 2001 FORMAT(31H0RPM-II CANNOT HANDLE MORE THAN,I3
     1,34H DIFFERENTIAL SPECIES. JOB ABORTED)
 2002 FORMAT(31H0RPM-II CANNOT HANDLE MORE THAN,I3
     1,21H SPECIES. JOB ABORTED)
 2003 FORMAT(14H0SPECIES NAME ,A4,21H NOT IN SPECIES LIST.
     1,12H JOB ABORTED)
  900 STOP
      END
      SUBROUTINE SORCES                                                 03840
C                                                                       03850
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF, 03860
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    03870
     2,MAXSTAB                                                          03880
      COMMON /SAVEIT/ ISAVE                                             03890
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         03900
      COMMON /NJECT/ DSTNCE(10),NSPECS(10),NAMESP(10,10),EMRAT1(10,10)  03910
     1,NSORCS,EMRAT2(10,10),TE(11),INJSP(10,10)                         03920
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           03930
     1,UNCOLD(40,10)                                                    03940
      DIMENSION SRCCOM(20),IUNITS(10),ZMOLWT(10)                        03950
C                                                                       03960
C READ EMISSIONS DATA                                                   03970
C     NOTE... IUNITS=1 - EMISSIONS IN GM/SEC                            03980
C             IUNITS=2 - EMISSIONS IN PPM*M3/SEC                        03990
C             ...IF IUNITS=1, CONVERSION TO PPM*M3/SEC                  04000
C                IS NECESSARY. PRESS (IN MB), TEMP (IN DEG-K)           04010
C                AND ZMOLWT FOR EACH SPECIES IS REQUIRED.               04020
C                                                                       04030
      READ(NIN,1000) (SRCCOM(I),I=1,20)                                 04040
      READ(NIN,1001) NSORCS                                             04050
      IF(NSORCS.EQ.0) GO TO 999                                         04060
      DO 10 J=1,NSORCS                                                  04070
      READ(NIN,1002) DSTNCE(J),NSPECS(J),IUNITS(J),PRESS,TEMP           04080
      NSPCS=NSPECS(J)                                                   04090
      READ(NIN,1003) (NAMESP(I,J),EMRAT2(I,J),ZMOLWT(I),I=1,NSPCS)      04100
C                                                                       04110
C     IDENTIFY INJECTED SPECIES                                         04120
C                                                                       04130
      DO 8 IS=1,NSPCS                                                   04140
      DO 6 NT=1,NTOT                                                    04150
    6 IF(NAMESP(IS,J).EQ.NAME(NT)) GO TO 7                              04160
    7 INJSP(IS,J)=NT                                                    04170
    8 CONTINUE                                                          04180
C                                                                       04190
      IF(IUNITS(J).EQ.2) GO TO 10                                       04200
      DO 9 I=1,NSPCS                                                    04210
      EMRAT1(I,J)=EMRAT2(I,J)                                           04220
      EMRAT2(I,J)=EMRAT1(I,J)*TEMP*8.314E4/(PRESS*ZMOLWT(I))             04230
    9 CONTINUE                                                          04240
   10 CONTINUE                                                          04250
C                                                                       04260
      WRITE(NOUT,5000) (SRCCOM(I),I=1,20)                               04270
      DO 100 J=1,NSORCS                                                 04280
      NSPCS=NSPECS(J)                                                   04290
      DIST9=DSTNCE(J)/1000.                                             04300
      WRITE(NOUT,5001) J,DIST9                                          04310
      DO 100 I=1,NSPCS                                                  04320
      IF(IUNITS(J).EQ.1) WRITE(NOUT,5002) NAMESP(I,J),INJSP(I,J)        04330
     1,EMRAT1(I,J),EMRAT2(I,J)                                          04340
      IF(IUNITS(J).EQ.2) WRITE(NOUT,5003) NAMESP(I,J),INJSP(I,J)        04350
     1,EMRAT2(I,J)                                                      04360
  100 CONTINUE                                                          04370
C                                                                       04380
C     OUTPUT TO DISK IF ISAVE=1                                         04390
C                                                                       04400
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        999 IF(ISAVE.NE.1) RETURN                                      04410
            WRITE(NDISK) (SRCCOM(I),I=1,20),NSORCS                     04420
            IF(NSORCS.EQ.0) RETURN                                     04430
            DO 200 J=1,NSORCS                                          04440
            NSPCS=NSPECS(J)                                            04450
            WRITE(NDISK) NSPECS(J),DSTNCE(J),(NAMESP(I,J),EMRAT1(I,J)  04460
           1,EMRAT2(I,J),I=1,NSPCS)                                    04470
        200 CONTINUE                                                   04480
            RETURN                                                     04490
      C                                                                04500
      C INPUT FORMATS                                                  04510
      C                                                                04520
       1000 FORMAT(20A4)                                               04530
       1001 FORMAT(I4)                                                 04540
       1002 FORMAT(F10.0,2I4,2F10.0)                                   04550
       1003 FORMAT(A4,2F10.0,56X)                                      04560
      C                                                                04570
      C OUTPUT FORMATS                                                 04580
      C                                                                04590
       5000 FORMAT(1H1,20A4,/1H0)                                      04600
       5001 FORMAT(1H0,8HSOURCE 0,I2,9X,19HDOWNWIND DISTANCE- ,F4.1,3H KM
           1,/1H0,10X,21HSPECIES   SPECIES NO.,9X,13HEMISSION RATE,/1X) 04620
       5002 FORMAT(13X,A4,9X,I2,13X,1PE9.3,9H (CM/SEC),10X,1PE9.3      04630
           1,13H (PPM*M3/SEC))                                         04640
       5003 FORMAT(13X,A4,9X,I2,13X,1PE9.3,13H (PPM*M3/SEC))           04650
            END                                                        04660
      SUBROUTINE METIN                                                  04670
C                                                                       04680
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF, 04690
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    04700
     2,MAXSTAB                                                          04710
      COMMON /AMBNT3/ YAMBIN(40,10),AMBT(10)                            04720
      COMMON /MISC/ XBEG,XEND,TBEG,TEND,IOUT,DCOUNT,DIST(10),KDIST      04730
      COMMON /SAVEIT/ ISAVE                                             04740
      COMMON /SINDEX/ IAERS,L1,L2,L4                                    04750
      COM.ON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            04760
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         04770
      COMMON /INPUT2/ XMIX(10),DEPTH(10),XRAD(10),WIDTH(10),TK1(10)     04780
     1       ,FACTK1(10),WINDSP(10),WTIME(10)                           04790
      COMMON /INPUT3/ NMIX,NRAD,NK1T,NAMB,NWIND                         04800
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              04810
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  04820
     1,SRK(99)                                                          04830
C                                                                       04840
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           04850
     1,UNCOLD(40,10)                                                    04860
      DIMENSION METCOM(20),AMBIN(10),NTEST9(40)                         04870
      INTEGER WNDOPT,HDSOPT,VDSOPT,AMBOPT                               04880
C                                                                       04890
      READ(NIN,999) (METCOM(I),I=1,20)                                  04900
C                                                                       04910
C     OPTIONS- NOTE, THIS PORTION OF CODE NOT FULLY DEVELOPED           04920
C                                                                       04930
C                                                                       04940
      READ(NIN,1003) WNDOPT,HDSOPT,VDSOPT,K1OPT,AMBOPT                  04950
C                                                                       04960
C WIND INPUT                                                            04970
C                                                                       04980
      READ(NIN,1000) NWIND                                              04990
      READ(NIN,1001) (WINDSP(I),WTIME(I),I=1,NWIND)                     05000
C                                                                       05010
C HORIZONTAL DISPERSION INPUT                                           05020
C                                                                       05030
      IF(HDSOPT.EQ.1) GO TO 25                                          05040
      READ(NIN,1000) ISTAB                                              05050
      CALL DSPRSN(XBEG,XEND,XRAD,WIDTH,NRAD,ISTAB,1)                    05060
      GO TO 30                                                          05070
   25 READ(NIN,1000) NRAD                                               05080
      READ(NIN,1001) (XRAD(I),WIDTH(I),I=1,NRAD)                        05090
C                                                                       05100
C MIXING DEPTH INPUT                                                    05110
C                                                                       05120
   30 IF(VDSOPT.EQ.1) GO TO 35                                          05130
      IF(HDSOPT.NE.2) READ(NIN,1000) ISTAB                              05140
      CALL DSPRSN(XBEG,XEND,XMIX,DEPTH,NMIX,ISTAB,2)                    05150
      GO TO 40                                                          05160
   35 READ(NIN,1000) NMIX                                               05170
      READ(NIN,1001) (XMIX(I),DEPTH(I),I=1,NMIX)                        05180
C                                                                       05190
C K1 FACTOR INPUT                                                       05200
C                                                                       05210
   40  READ(NIN,1000) NK1T                                              05220
      READ(NIN,1001) (FACTK1(I),TK1(I),I=1,NK1T)                        05230
      C                                                                 05240
      C AMBIENT CONCENTRATION INPUT                                     05250
      C                                                                 05260
            READ(NIN,1000) NAMB                                         05270
            READ(NIN,1001) (AMBT(I),I=1,NAMB)                           05280
      C                                                                 05290
      C ZERO INSTANTANEOUS AMBIENT CONCENTRATIONS                       05300
      C                                                                 05310
            DO 90 J=1,NAMB                                              05320
            DO 90 K=1,NTOT                                              05330
         90 YAMBIN(K,J)=0.                                              05340
            DO 100 K=1,NFLW                                             05350
            READ(NIN,1002) NTEST,(AMBIN(J),J=1,NAMB)                    05360
      C                                                                 05370
      C IDENTIFY SPECIES NAME EXIT IF NOT FOUND                         05380
      C                                                                 05390
            DO 105 L=1,NTOT                                             05400
            LL=L                                                        05410
            IF(NTEST.EQ.3HNO2) L1=L                                     05420
            IF(NTEST.EQ.2HNO) L2=L                                      05430
            IF(NTEST.EQ.2HO3) L4=L                                      05440
            IF(NTEST.EQ.NAME(L)) GO TO 101                              05450
        105 CONTINUE                                                    05460
            WRITE(NOUT,9000) NTEST                                      05470
            STOP                                                        05480
      C                                                                 05490
      C STORE AMBIENT CONCENTRATIONS FOR SPECIES LL                     05500
      C                                                                 05510
        101 DO 120 IAMB=1,NAMB                                          05520
        120 YAMBIN(LL,IAMB)=AMBIN(IAMB)                                 05530
            IAMSP(K)=LL                                                 05540
            NTEST9(K)=NTEST                                             05550
        100 CONTINUE                                                    05560
      C                                                                 05570
      C PHOTO-STEADY-STATE (INITIAL ONLY)                               05580
      C                                                                 05590
            IF(YAMBIN(L2,1).EQ.0.) GO TO 150                            05600
            YAMBIN(L4,1)=YAMBIN(L1,1)*SRK(1)*FACTK1(1)/                 05610
           1   (YAMBIN(L2,1)*SRK(3))                                    05620
            YY(L4)=YY(L1)*SRK(1)*FACTK1(1)/(YY(L2)*SRK(3))              05630
      C                                                                 05640
      C SUBROUTINE METIN OUTPUT                                         05650
      C                                                                 05660
        150 WRITE(NOUT,5010) (METCOM(I),I=1,20)                         05670
           1,WNDOPT,HDSOPT,VDSOPT,K1OPT,AMBOPT                          05680
            WRITE(NOUT,5000)                                            05690
            DO 500 K=1,NWIND                                            05700
        500 WRITE(NOUT,5001) WINDSP(K),WTIME(K)                         05710
            WRITE(NOUT,5002)                                            05720
            DO 501 K=1,NRAD                                             05730
            XRAD9=XRAD(K)/1000.                                         05740
        501 WRITE(NOUT,5003) WIDTH(K),XRAD9                             05750
            WRITE(NOUT,5004)                                            05760
            DO 502 K=1,NMIX                                             05770
            XMIX9=XMIX(K)/1000.                                         05780
        502 WRITE(NOUT,5005) DEPTH(K),XMIX9                             05790
            WRITE(NOUT,5006)                                            05800
```

```
               DO 503 K=1,NK1T                                                    05810
           503 WRITE(NOUT,5007) FACTK1(K),TK1(K)                                  05820
               WRITE(NOUT,5008) (AMBT(J),J=1,NAMB)                                05830
               DO 504 K=1,NFLW                                                    05840
               KK=IAMSP(K)                                                        05850
           504 WRITE(NOUT,5009) NTEST9(K),(YAMBIN(KK,J),J=1,NAMB)                 05860
         C                                                                        05870
         C OUTPUT TO DISK IF ISAVE=1                                              05880
         C                                                                        05890
               IF(ISAVE.NE.1) RETURN                                              05900
               WRITE(NDISK) (METCOM(I),I=1,20)                                    05910
               WRITE(NDISK) NWIND,NRAD,NMIX,NK1T,NAMB                             05920
               WRITE(NDISK) (WINDSP(I),WTIME(I),I=1,NWIND)                        05930
               WRITE(NDISK) (XRAD(I),WIDTH(I),I=1,NRAD)                           05940
               WRITE(NDISK) (XMIX(I),DEPTH(I),I=1,NMIX)                           05950
               WRITE(NDISK) (FACTK1(I),TK1(I),I=1,NK1T)                           05960
               WRITE(NDISK) (AMBT(I),I=1,NAMB)                                    05970
               WRITE(NDISK) (NAME(K),(YAMBIN(K,J),J=1,NAMB),K=1,NTOT)             05980
               RETURN                                                             05990
         C                                                                        06000
         C INPUT FORMATS                                                          06010
         C                                                                        06020
           999 FORMAT(20A4)                                                       06030
          1000 FORMAT(I4)                                                         06040
          1001 FORMAT(8F10.0)                                                     06050
          1002 FORMAT(A4,1X,7F10.0,5X,/5X,7F10.0)                                 06060
          1003 FORMAT(10I2)                                                       06070
         C                                                                        06080
         C OUTPUT FORMATS                                                         06090
         C                                                                        06100
          5000 FORMAT(1H0,48X,22HWIND SPEED         TIME                          06110
              1,/50X,7H(M/SEC),9X,5H(MIN),/1H0)                                   06120
          5001 FORMAT(51X,F4.1,10X,F6.1)                                          06130
          5002 FORMAT(1H0,/46X,32HPLUME WIDTH    DOWNWIND DISTANCE,/50X           06140
              1,3H(M),13X,4H(KM),/1H0)                                            06150
          5003 FORMAT(48X,F7.1,11X,F5.1)                                          06160
          5004 FORMAT(1H0,/46X,32HMIXING DEPTH   DOWNWIND DISTANCE,/50X           06170
              1,3H(M),13X,4H(KM),/1H0)                                            06180
          5005 FORMAT(48X,F6.1,11X,F5.1)                                          06190
          5006 FORMAT(1H0,/48X,22HK1 FACTOR          TIME,/48X                    06200
              1,6H(/MIN),11X,5H(MIN),/1H0)                                        06210
          5007 FORMAT(48X,1PE9.3,8X,0PF6.1)                                       06220
          5008 FORMAT(1H0,/48X,28HAMBIENT CONCENTRATIONS (PPM),/1H0               06230
              1,/21X,7HSPECIES,11X,11HTIMES (MIN),/1H0,38X,10(F5.0,4X),/1H0)      06240
          5009 FORMAT(23X,A4,10X,10(1PE9.2,1X))                                   06250
          5010 FORMAT(1H1,20A4,/1H0,9HOPTIONS- ,8HWNDOPT- ,I2                     06260
              1,/10X,8HHDSOPT- ,I2,/10X,8HVDSOPT- ,I2,/10X,8H K1OPT- ,I2          06270
              2,/10X,8HAMBOPT- ,I2)                                               06280
         C                                                                        06290
         C ERROR FORMATS                                                          06300
         C                                                                        06310
          9000 FORMAT(25H0JOB ABORT- SPECIES NAME(,A4                             06320
              1,24H) IS NOT IN SPECIES LIST)                                      06330
               END                                                                06340
```

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SUBROUTINE DSPRSN     76/76    OPT=1                    FTN 4.6+459       08/10/79  15.54.340       PAGE     1
                    SUBROUTINE DSPRSN(X1,X2,X,Y,N,IS,ICODE)                              06350
          C                                                                              06360
                    COMMON /GEOM3/ DEFNW,FACTR                                           06370
                    DIMENSION X(10),Y(10),A(5),B(5),Q(5)                                 06380
          C                                                                              06390
                    DATA A/0.40,0.295,0.20,0.13,0.098/                                   06400
                    DATA B/0.125,0.119,0.111,0.105,0.100/                                06410
                    DATA Q/1.03,0.986,0.911,0.827,0.778/                                 06420
          C                                                                              06430
                    XINT=(X2-X1)/9.                                                      06440
                    N=10                                                                 06450
                    DO 100 I=1,10                                                        06460
                    X(I)=X1+(I-1)*XINT                                                   06470
                    EX=Q(IS)                                                             06480
                    IF(ICODE.EQ.1) Y(I)=A(IS)*X(I)**0.903                                06490
                    IF(ICODE.EQ.2) Y(I)=B(IS)*X(I)**EX                                   06500
                    Y(I)=Y(I)*DEFNW                                                      06510
                100 CONTINUE                                                             06520
                    RETURN                                                               06530
                    END                                                                  06540
```

```
      SUBROUTINE INITLZ(STPCOD)                                         06550
C                                                                       06560
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         06570
      COMMON /INPUT2/ XMIX(10),DEPTH(10),XRAD(10),WIDTH(10),TK1(10)     06580
     1        ,FACTK1(10),WINDSP(10),WTIME(10)                          06590
      COMMON /GEOM1/ HT(10),W(10),RC(10),RB(11),HAM,HAP                 06600
      COMMON /UPDAT/ WIND,FRAD,FMIX,FK1,SIGY,SIGZ                       06610
      COMMON /INPUT4/ MODE1,MODE2,MODE3                                 06620
      COMMON /GEOM2/ RFACC(10),RFACB(11),RADFAC(10),WFAC(10)            06630
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  06640
     1,SRK(99)                                                          06650
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              06660
      COMMON /AMBNT3/ YAMBIN(40,10),AMBT(10)                            06670
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           06680
     1,UNCOLD(40,10)                                                    06690
      COMMON /TIME/ TINCR1,TINCR2,TCNT1,TCNT2                           06700
      COMMON /GEOM3/ DEFNW,FACTR                                        06710
      COMMON /INPUT3/ NMIX,NRAD,NK1T,NAMB,NWIND                         06720
      COMMON /MISC/ XBEG,XEND,TBEG,TEND,IOUT,DCOUNT,DIST(10),KDIST      06730
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF               06740
      COMMON /TERMS1/ TEL1(10),TEL2(10),TER1(10),TER2(10),TU1(10)       06750
     1,TU2(10),TDN1(10),TDN2(10),TQ(10),TDR1(10),TDR2(10),TDL1(10)      06760
     2,TDL2(10),TDIVL(10),TDIVR(10),TDIV(10)                            06770
      COMMON /RATES/ RK1,RK36R1,RK37R1,RK65R1                           06780
      COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT   06790
      COMMON /NJECT/ DSTNCE(10),NSPECS(10),NAMESP(10,10),EMRAT1(10,10)  06800
     1,NSORCS,EMRAT2(10,10),TE(11),INJSP(10,10)                         06810
      COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                          06820
      COMMON /PLOTS/ STIMEA(100),STIMEP(100),SPLMC(40,100),SAMBC(40,100)06830
      COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            06840
      COMMON /GROUND/ VDEP(40),VSORCE(40),YGRND(40)                     06850
      COMMON /SINDEX/ IAERS,L1,L2,L4                                    06860
      INTEGER STPCOD                                                    06870
      LOGICAL HALF                                                      06880
C                                                                       06890
      DATA JFLAG/0/                                                     06900
      DATA IHELP/0/                                                     06910
C                                                                       06920
      IF(KAMBNT.EQ.2) GO TO 200                                         06930
C                                                                       06940
C AMBIENT RUN                                                           06950
C                                                                       06960
  100 N=NDIF                                                            06970
      MHALF=NDIF-1                                                      06980
      NC5=1                                                             06990
      JFLAG=1                                                           07000
      IF(MODE2.EQ.3) TINCR2=(TEND-TBEG)/9.                              07010
      DO 105 NT=1,NTOT                                                  07020
      DO 106 J=1,100                                                    07030
  106 SAMBC(NT,J)=0.0                                                   07040
      IF(NT.GT.NDIF) GO TO 104                                          07050
      Y(NT,1)=YY(NT)                                                    07060
      IF(NFLAG(NT).EQ.1) Y(NT,1)=YAMBIN(NT,1)                           07070
      C(NT,1)=Y(NT,1)                                                   07080
      GO TO 110                                                         07090
  104 C(NT,1)=YY(NT)                                                    07100
  110 DO 105 NF=1,NFLW                                                  07110
```

```
      I=IAMSP(NF)                                                       07120
  105 SAMBC(I,1)=YAMBIN(I,1)                                            07130
      STIMEA(1)=TBEG                                                    07140
      TEL1(1)=0.0                                                       07150
      TER1(1)=0.0                                                       07160
      TEL2(1)=0.0                                                       07170
      TER2(1)=0.0                                                       07180
      TU1(1)=0.0                                                        07190
      TU2(1)=0.0                                                        07200
      TDN1(1)=0.0                                                       07210
      TDN2(1)=0.0                                                       07220
      TDL1(1)=0.0                                                       07230
      TDR1(1)=0.0                                                       07240
      TDL2(1)=0.0                                                       07250
      TDR2(1)=0.0                                                       07260
      GO TO 500                                                         07270
C                                                                       07280
C PLUME SIMULATION                                                      07290
C                                                                       07300
  200 NC5=NCELLS                                                        07310
      IF(HALF) NC5=NCELLS/2                                             07320
      MHALF=NDIF                                                        07330
      N=NC5*NDIF                                                        07340
      IF(JFLAG.EQ.1) NAMB=II                                            07350
      IF(JFLAG.EQ.1) GO TO 250                                          07360
      DO 201 NT=1,40                                                    07370
      DO 201 J=1,100                                                    07380
  201 SAMBC(NT,J)=0.0                                                   07390
      DO 205 NF=1,NFLW                                                  07400
      I=IAMSP(NF)                                                       07410
      DO 205 J=1,NAMB                                                   07420
      SAMBC(I,J)=YAMBIN(I,J)                                            07430
  205 CONTINUE                                                          07440
      DO 206 J=1,NAMB                                                   07450
  206 STIMEA(J)=AMBT(J)                                                 07460
  250 DO 255 NT=1,NTOT                                                  07470
      SPLMC(NT,1)=YY(NT)                                                07480
      DO 255 NS=2,100                                                   07490
      SPLMC(NT,NS)=0.0                                                  07500
  255 CONTINUE                                                          07510
      STIMEP(1)=TBEG                                                    07520
      KDIST=1                                                           07530
      DCOUNT=DIST(KDIST)                                                07540
C                                                                       07550
C     ESTABLISH PLUME INJECTION TIMES                                   07560
C                                                                       07570
      IF(NSORCS.EQ.0) GO TO 270                                         07580
      INJCT=1                                                           07590
      ET=WTIME(NWIND)/1000.                                             07600
      DO 265 IS=1,NSORCS                                                07610
      D=XBEG                                                            07620
      T4=0.0                                                            07630
      IF(NWIND.NE.1) GO TO 259                                          07640
      TE(IS)=DSTNCE(IS)/(WINDSP(1)*60.)                                 07650
      GO TO 265                                                         07660
  259 KFLAG=0                                                           07670
      DO 260 K=1,1000                                                   07680
      T5=K*ET                                                           07690
      CALL INTERP(T5,W5,WTIME,WINDSP,NWIND,45,KFLAG)                    07700
      KFLAG=1                                                           07710
      D=D+W5*(T5-T4)                                                    07720
      IF(D.GE.DSTNCE(IS)) GO TO 261                                     07730
      T4=T5                                                             07740
  260 CONTINUE                                                          07750
  261 TE(IS)=T5-(D-DSTNCE(IS))/(W5*60.)                                 07760
  265 CONTINUE                                                          07770
      WRITE(6,6644) (I,TE(I),I=1,NSORCS)                                07780
 6644 FORMAT(1H0,29HINJECTION TIME FOR SOURCE NO.,I3,4H IS ,            07790
     1 1PE10.3,5H MIN.)                                                 07800
      TE(NSORCS+1)=1.E40                                                07810
C                                                                       07820
C ESTABLISH CELL GEOMETRY (PLUME SIMULATION ONLY)                       07830
C                                                                       07840
  270 CALL CLLDIM(NCELLS)                                               07850
C                                                                       07860
C SPLIT MEAN CONCENTRATIONS INTO CELL CONCENTRATIONS                    07870
C                                                                       07880
      DO 280 I=1,NTOT                                                   07890
      YIN(I)=SAMBC(I,1)                                                 07900
  280 YAV(I)=YY(I)                                                      07910
C                                                                       07920
      CALL DEVCON(NTOT,2,YAV,C,NCELLS,WFAC,NFLAG,YIN)                   07930
C                                                                       07940
C     PHOTO STEADY-STATE (PLUME)                                        07950
C                                                                       07960
      DO 290 NC=1,NCELLS                                                07970
      IF(C(L2,NC).EQ.0.) GO TO 290                                      07980
      C(L4,NC)=C(L1,NC)*SRK(1)*FACTK1(1)/(C(L2,NC)*SRK(3))              07990
  290 CONTINUE                                                          08000
      DO 300 J=1,NCELLS                                                 08010
      DO 300 I=1,NDIF                                                   08020
      K=(J-1)*NDIF+I                                                    08030
      Y(K,1)=C(I,J)                                                     08040
  300 CONTINUE                                                          08050
      DO 325 I=1,NTOT                                                   08060
      YAML(I)=SAMBC(I,1)                                                08070
      YAMR(I)=YAML(I)                                                   08080
  325 YAMT(I)=YAML(I)                                                   08090
C                                                                       08100
      SIGY=WIDTH(1)/DEFNW                                               08110
      DO 350 J=1,NCELLS                                                 08120
      HT(J)=DEPTH(1)                                                    08130
      RC(J)=RFACC(J)*SIGY                                               08140
      RB(J)=RFACB(J)*SIGY                                               08150
  350 W(J)=WFAC(J)*SIGY                                                 08160
      RB(NCELLS+1)=RFACB(NCELLS+1)*SIGY                                 08170
C                                                                       08180
C FOR BOTH AMBIENT AND PLUME SIMULATIONS                                08190
C                                                                       08200
  500 WIND=WINDSP(1)                                                    08210
      FRAD=WIDTH(1)                                                     08220
      FMIX=DEPTH(1)                                                     08230
      FK1=FACTK1(1)                                                     08240
      TCNT1=TINCR1                                                      08250
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SUBROUTINE INITLZ      76/76    OPT=1                    FTN 4.6+459         08/10/79  15.54.340        PAGE    4
                 TCNT2=TINCR2
                 TIME=TBEG
                 TOLD=TBEG
                 FETCH=XBEG
                 H=HSTART
                 STPCOD=0
                 JSTART=0
                 NRESET=0
                 MF=1
                 II=1
                 DUM=1.0
                 NCL1=NCELLS+1
                 MCODE=2
                 DO 505 I=1,NTOT
                 VDEP(I)=0.0
                 VSORCE(I)=0.0
                 YGRND(I)=0.0
                 DO 505 J=1,NCELLS
             505 UNCOLD(I,J)=0.0
           C
           C RATE CONSTANTS
           C
                 DO 510 I=1,NRXN
             510 RK(I)=SRK(I)
           C
                 RK1=RK(1)                                                    *
                 RK36R1=RK(36)/RK(1)
                 RK37R1=RK(37)/RK(1)
                 RK65R1=RK(65)/RK(1)
           C
                 RK(1)=FK1*RK1
                 RK(36)=RK1*RK36R1
                 RK(37)=RK1*RK37R1
                 RK(65)=RK1*RK65R1
           C
                 RETURN
                 END
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* Portions of the computer code outlined in the box are set up specifically for the Carbon-Bond Mechanism given in the sample data sets. Basically, the code ensures that reactions 36, 37, and 65 proceed at a rate proportional to the rate of the NO_2 photolysis reaction. Substitution of a different chemical mechanism will require alterations in these portions of code.

```
SUBROUTINE DEVCON      76/76   OPT=1                    FTN 4.6+439          08/10/79  15.54.340        PAGE      1

            SUBROUTINE DEVCON(N,ICODE,YAV,YC,NC,RF,NFLAG,YIN)                          08630
      C                                                                                08640
      C     IF ICODE=1,  A CROSS PLUME AVERAGE IS OBTAINED FROM                        08650
      C                  CELL AVERAGES                                                 08660
      C     IF ICODE=2,  CELL AVERAGES ARE OBTAINED FROM THE CROSS                     08670
      C                  SECTION AVERAGE ASSUMING A GAUSSIAN DIST.                     08680
      C                                                                                08690
            COMMON /GEOM3/ DEFNW,FACTR                                                 08700
      C                                                                                08710
            DIMENSION YAV(50),YC(40,20),RF(20),WF(20),YTEMP(20)                        08720
            DIMENSION NFLAG(40),YIN(40)                                                08730
      C                                                                                08740
            IF(ICODE.EQ.2) GO TO 100                                                   08750
            DO 60 I=1,N                                                                08760
            SUM=0.0                                                                    08770
            SUMR=0.0                                                                   08780
            DO 50 J=1,NC                                                               08790
            SUMR=SUMR+RF(J)                                                            08800
         50 SUM=SUM+YC(I,J)*RF(J)                                                      08810
            YAV(I)=SUM/SUMR                                                            08820
         60 CONTINUE                                                                   08830
            RETURN                                                                     08840
      C                                                                                08850
        100 NC2=NC/2.                                                                  08860
            IF(NC.NE.2) GO TO 120                                                      08870
            DO 110 I=1,N                                                               08880
            YC(I,1)=YAV(I)                                                             08890
        110 YC(I,2)=YAV(I)                                                             08900
            RETURN                                                                     08910
        120 NC21=NC2+1                                                                 08920
            DO 150 I=NC21,NC                                                           08930
            INC2=I-NC2                                                                 08940
        150 WF(INC2)=RF(I)                                                             08950
            DO 500 I=1,N                                                               08960
            IF(NFLAG(I).EQ.1) GO TO 300                                                08970
            DO 290 J=1,NC                                                              08980
        290 YC(I,J)=YAV(I)                                                             08990
            GO TO 500                                                                  09000
        300 SUM=0.0                                                                    09010
            YTEMP(1)=DEFNW*(YAV(I)-YIN(I))/(NC*WF(1))                                  09020
            DO 400 J=2,NC2                                                             09030
            JM1=J-1                                                                    09040
        400 YTEMP(J)=YTEMP(JM1)*WF(JM1)/WF(J)                                          09050
            DO 420 J=1,NC2                                                             09060
            NCP=NC2+J                                                                  09070
            NCR=NC2-J+1                                                                09080
            YC(I,NCP)=YTEMP(J)+YIN(I)                                                  09090
        420 YC(I,NCR)=YTEMP(J)+YIN(I)                                                  09100
        500 CONTINUE                                                                   09110
            RETURN                                                                     09120
            END                                                                        09130
      SUBROUTINE CLLDIM(NCELLS)                                          09140
C                                                                        09150
C     THIS SUBROUTINE DETERMINES WIDTH FACTORS FOR                       09160
C     CALCULATING CELL WIDTHS.  ROOTS OF THE EQUATION,                   09170
C     D-ERF(UJ)+ERF(UJ1)=0.0 ARE OBTAINED BY THE SECANT                  09180
C     METHOD... D=2*FACTF/XN, WHERE FACTF=ERF(DEFNW/(2.*SQRT(2.))),      09190
C     CORRESPONDING TO TOTAL PLUME WIDTH OF DEFNW*SIGMAY,                09200
C     AND XN=NCELLS.... UJ=YJ/(SQRT(2)*SIGMAY),UJ1=UJ-1                  09210
C     AND RADFAC IS THE RESULTING WIDTH FACTOR                           09220
C                                                                        09230
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,  09240
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND     09250
     2,MAXSTAB                                                           09260
      COMMON /COEFFS/ KALPHA(10),KBETA(10)                               09270
      COMMON /GEOM3/ DEFNW,FACTR                                         09280
      COMMON /F1/ FACTF                                                  09290
      COMMON /SAVEIT/ ISAVE                                              09300
      COMMON /GEOM2/ RFACC(10),RFACB(11),RADFAC(10),WFAC(10)             09310
      DATA N/100/,EPS/1.E-10/                                            09320
C                                                                        09330
      NCL1=NCELLS+1                                                      09340
      NC2=NCELLS/2                                                       09350
      NC21=NC2-1                                                         09360
      RADFAC(NC2)=DEFNW/2.                                               09370
      IF(NC2.NE.1) GO TO 35                                              09380
      WFAC(1)=RADFAC(NC2)                                                09390
      WFAC(2)=RADFAC(NC2)                                                09400
      RFACC(1)=-WFAC(1)/2.                                               09410
      RFACC(2)=WFAC(2)/2.                                                09420
      RFACB(1)=-WFAC(1)                                                  09430
      RFACB(3)=WFAC(2)                                                   09440
      KALPHA(1)=0                                                        09450
      KALPHA(2)=1                                                        09460
      GO TO 301                                                          09470
   35 CONTINUE                                                           09480
      M=NCELLS                                                           09490
      NC=1                                                               09500
      A=0.005                                                            09510
      B=3.0                                                              09520
      UJ1=0.0                                                            09530
   40 L=1                                                                09540
   50 TOPA=F(A,UJ1,M)                                                    09550
      TOPB=F(B,UJ1,M)                                                    09560
      BOTB=TOPB-TOPA                                                     09570
      X=(A*TOPB-B*TOPA)/BOTB                                             09580
      FX=F(X,UJ1,M)                                                      09590
      IF(ABS(FX).LT.EPS) GO TO 100                                       09600
      IF(L.GT.N) GO TO 90                                                09610
      B=X                                                                09620
      L=L+1                                                              09630
      GO TO 50                                                           09640
   90 WRITE(6,1000) NC,L,X,FX                                            09650
      STOP                                                               09660
  100 UJ1=X                                                              09670
      RADFAC(NC)=X*SQRT(2.)                                              09680
      IF(NC.EQ.NC21) GO TO 200                                           09690
      NC=NC+1                                                            09700
      A=X+0.005
      B=3.0
      GO TO 40
  200 RFACB(NC2+1)=0.0
      DO 300 NC=1,NC2
      NC1=NC-1
      DRAD=RADFAC(NC)
      DR=RADFAC(NC)
      CR=RADFAC(NC)/2.
      IF(NC1.GT.0) DRAD=RADFAC(NC)-RADFAC(NC1)
      IF(NC1.GT.0) CR=RFACB(NCP+1)+DRAD/2.
      NCP=NC2+NC
      NCR=NC2-NC+1
      RFACB(NCP+1)=DR
      RFACB(NCR)=-DR
      RFACC(NCP)=CR
      RFACC(NCR)=-CR
      WFAC(NCP)=DRAD
      WFAC(NCR)=DRAD
      KALPHA(NCP)=1
      KALPHA(NC)=0
  300 CONTINUE
  301 WRITE(NOUT,1003)
      DO 305 NC=1,NCELLS
  305 WRITE(NOUT,1001) NC,WFAC(NC),RFACC(NC),RFACB(NC)
      WRITE(NOUT,1002) NCL1, RFACB(NCL1)
 1001 FORMAT(9H CELL NO.,I4,2X,13HWIDTH FACTOR-,1PE12.3
     1,20H, CENTERLINE FACTOR-,1PE12.3,18H, BOUNDARY FACTOR-
     2,1PE12.3)
 1002 FORMAT(10H INDEX NO.,I3,61X,16HBOUNDARY FACTOR-,1PE12.3)
 1003 FORMAT(1H1,14HPLUME GEOMETRY,1H0)
C
C     OUTPUT TO DISK IF ISAVE=1
C
      IF(ISAVE.NE.1) RETURN
      WRITE(NDISK) (WFAC(J),RFACC(J),KALPHA(J),J=1,NCELLS)
      WRITE(NDISK) (RFACB(J),J=1,NCL1)
      RETURN
 1000 FORMAT(1H0,*POOR CONVERGENCE, NC=*,I3,* L=*,I3
     1,* X=*,1PE12.5,* FX=*,1PE12.5)
      END
```

```
FUNCTION F            76/76    OPT=1                                   FTN 4.6+459          08/10/79  15.54.340        PAGE     1
                   FUNCTION F(UJ,UJ1,M)                                                               10120
                   COMMON /GEOM3/ DEFNW,FACTR                                                         10130
                   COMMON /F1/ FACTF                                                                  10140
                   DATA IC/0/                                                                         10150
                   IF(IC.EQ.1) GO TO 50                                                               10160
                   FACTF=ERF(DEFNW/(2.*SQRT(2.)))                                                     10170
                   XM=M                                                                               10180
                   D=2.*FACTF/XM                                                                      10190
                   IC=1                                                                               10200
                50 F=D-ERF(UJ)+ERF(UJ1)                                                               10210
                   RETURN                                                                             10220
                   END                                                                                10230
```

```
FUNCTION ERF        76/76    OPT=1                      FTN 4.6+489      08/10/79  15.54.840      PAGE     1

                    FUNCTION ERF(X)                                                       10240
                    DATA A1,A2,A3,A4,A5,A6/0.0705230784,0.0422820123                      10250
                   1,0.0092705272,0.0001520143,0.0002765672,0.0000430638/                 10260
                    DEN=1.+A1*X+A2*X*X+A3*X**3+A4*X**4+A5*X**5+A6*X**6                    10270
                    ERF=1.-1./DEN**16                                                     10280
                    RETURN                                                                10290
                    END                                                                   10300
```

```
              SUBROUTINE UPDATE                                                             10310
        C                                                                                   10320
              COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,            10330
             1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND                10340
             2,MAXSTAB                                                                      10350
              COMMON /GEOM1/ HT(10),W(10),RC(10),RB(11),HAM,HAP                             10360
              COMMON /GEOM2/ RFACC(10),RFACB(11),RADFAC(10),WFAC(10)                        10370
              COMMON /NJECT/ DSTNCE(10),NSPECS(10),NAMESP(10,10),EMRAT1(10,10)              10380
             1,NSORCS,EMRAT2(10,10),TE(11),INJSP(10,10)                                     10390
              COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS                     10400
              COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT               10410
              COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF                           10420
              COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                                      10430
              COMMON /UPDAT/ WIND,FRAD,FMIX,FK1,SIGY,SIGZ                                   10440
              COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)                        10450
        C                                                                                   10460
              DATA IHELP/0/                                                                 10470
        C                                                                                   10480
              DELT=TIME-TOLD                                                                10490
              DELT=AMAX1(HMIN,DELT)                                                         10500
              FETCH=FETCH+WIND*DELT*60.                                                     10510
           60 TOLD=TIME                                                                     10520
        C                                                                                   10530
        C     EMISSIONS INJECTIONS                                                          10540
        C                                                                                   10550
              IF(KAMBNT.NE.1.AND.NSORCS.NE.0) CALL INJECT                                   10560
              IF(IHELP.EQ.1)                                                                10570
            1  WRITE(NOUT,1000) DELT,H,TIME,FK1,C(3,1),C(4,1),C(5,1),C(6,1)                 10580
         1000 FORMAT(* H=*,1PE10.3,* HNEW=*,1PE10.3,* T=*,1PE10.3,* FK1=*                   10590
             1,1PE21.14,* Y-3,4,5,6=*,4(1PE10.3))                                           10600
              RETURN                                                                        10610
              END                                                                           10620
```

```
SUBROUTINE RATES      76/76    OPT=1                          FTN 4.6+439          08/10/79   15.54.540        PAGE       1

                  SUBROUTINE RATES(T)                                                             10630
            C                                                                                     10640
                  COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)                10650
                 1,SRK(99)                                                                        10660
                  COMMON /GEOM1/ HT(10),W(10),RC(10),RB(11),HAM,HAP                               10670
                  COMMON /GEOM2/ RFACC(10),RFACB(11),RADFAC(10),WFAC(10)                          10680
                  COMMON /RATE1/ Q(10),FHT(10),FR(11),QW,FVDL(10)                                 10690
                  COMMON /UPDAT/ WIND,FRAD,FMIX,FK1,SICY,SIGZ                                     10700
                  COMMON /RATES/ RK1,RK36R1,RK37R1,RK65R1                                         10710
                  COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)                            10720
                  COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS                       10730
                  COMMON /INPUT2/ XMIX(10),DEPTH(10),XRAD(10),WIDTH(10),TK1(10)                   10740
                 1      ,FACTK1(10),WINDSP(10),WTIME(10)                                          10750
                  COMMON /INPUT3/ NMIX,NRAD,NK1T,NAMB,NWIND                                       10760
                  COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT                 10770
                  COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)                          10780
                  COMMON /COEFFS/ KALPHA(10),KBETA(10)                                            10790
                  COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                                        10800
                  COMMON /GEOM3/ DEFNW,FACTR                                                      10810
                  COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF                             10820
                  COMMON /PLOTS/ STIMEA(100),STIMEP(100),SPLMC(40,100),SAMBC(40,100)              10830
                  COMMON /DFSVTY/ ZKH(11)                                                         10840
            C                                                                                     10850
                  DIMENSION AMB(100),CTEMP(10)                                                    10860
                  DATA IHELP/0/                                                                   10870
            C                                                                                     10880
                  KFLAG=1                                                                         10890
                  IF(MCODE.EQ.2) KFLAG=0                                                          10900
            C                                                                                     10910
                  CALL INTERP(T,WIND,WTIME,WINDSP,NWIND,41,KFLAG)                                 10920
                  CALL INTERP(T,FK1,TK1,FACTK1,NK1T,42,KFLAG)                                     10930
            C                                                                                     10940
                  RK(1)=FK1                                                                       10950*
                  RK(36)=FK1*RK36R1                                                               10960
                  RK(37)=FK1*RK37R1                                                               10970
                  RK(65)=FK1*RK65R1                                                               10980
            C                                                                                     10990
                  IF(MCODE.NE.0) MCODE=0                                                          11000
                  IF(KAMBNT.NE.2) RETURN                                                          11010
            C                                                                                     11020
                  DELT=T-TOLD                                                                     11030
                  DELT=AMAX1(HMIN,DELT)                                                           11040
                  F=FETCH+WIND*DELT*60.                                                           11050
                  DELTA=0.05*H                                                                    11060
                  IF(DELTA.LT.HMIN) DELTA=HMIN                                                    11070
                  DELTB=2.0*DELTA                                                                 11080
                  F2=F+WIND*DELTA*60.                                                             11090
                  F1=F-WIND*DELTA*60.                                                             11100
                  T2=T+DELTA                                                                      11110
                  T1=T-DELTA                                                                      11120
            C                                                                                     11130
                  CALL INTERP(F2,FMIX2,XMIX,DEPTH,NMIX,43,KFLAG)                                  11140
                  CALL INTERP(F1,FMIX1,XMIX,DEPTH,NMIX,43,KFLAG)                                  11150
                  CALL INTERP(F2,FRAD2,XRAD,WIDTH,NRAD,44,KFLAG)                                  11160
                  CALL INTERP(F1,FRAD1,XRAD,WIDTH,NRAD,44,KFLAG)                                  11170
                  CALL INTERP(T2,WIND2,WTIME,WINDSP,NWIND,41,KFLAG)                               11180
                  CALL INTERP(T1,WIND1,WTIME,WINDSP,NWIND,41,KFLAG)                               11190
```

* See section 4.2.10 of text.

```
C
      FRAD=0.5*(FRAD2+FRAD1)
      FMIX=0.5*(FMIX2+FMIX1)
C
      DO 75 NF=1,NFLW
      I=IAMSP(NF)
      DO 80 NL=1,NAMB
   80 AMB(NL)=SAMBC(I,NL)
C
      CALL INTERP(T,YTEMP,STIMEA,AMB,NAMB,NF,KFLAG)
      YAML(I)=YTEMP
      YAMR(I)=YAML(I)
      YAMT(I)=YAML(I)
      YIN(I)=(YAML(I)+YAMR(I))*0.5
   75 CONTINUE
C
  110 SIGY=FRAD/DEFNW
      NC2=NCELLS/2+1
      DO 300 I=1,NCELLS
      HT(I)=FMIX
      RC(I)=RFACC(I)*SIGY
      RB(I)=RFACB(I)*SIGY
      W(I)=WFAC(I)*SIGY
      QV=(FMIX2-FMIX1)/(HT(I)*DELTB)
      QH= WFAC(I)*(FRAD2-FRAD1)/(W(I)*DELTB*DEFNW)
      Q(I)=QH+QV
      VDL=(FMIX2-FMIX1)*W(I)
      HDL=(FRAD2-FRAD1)*HT(I)
      FVDL(I)=1.0
      FHT(I)=(FMIX2-FMIX1)/DELTB
      IF(I.NE.NC2) FR(I)=RFACB(I)*(FRAD2-FRAD1)/(DELTB*DEFNW)
      IC=C(1,I)*1.E12
      C(1,I)=IC/1.E12
      CTEMP(I)=C(1,I)
      KBETA(I)=0
      IF(FHT(I).LT.0.0) KBETA(I)=1
  300 CONTINUE
      FR(NC2)=0.0
      RB(NCL1)=RFACB(NCL1)*SIGY
      FR(NCL1)=RFACB(NCL1)*(FRAD2-FRAD1)/(DELTB*DEFNW)
      QW=(WIND2-WIND1)/(DELTB*WIND)
      HAP=HT(NCELLS)
      HAM=HT(1)
C
C DIFUSIVITY CALCULATION
C
      CALL DFSVTY(RC,FR,CTEMP,ZKH,NCELLS,TIME)
C
      RETURN
      END
      SUBROUTINE INTERP(YX,FX,YD,FD,ND,N,NFLAG)                         11700
C                                                                       11710
      DIMENSION YD(ND),FD(ND),A(4),Y(4),LINTRP(50)                      11720
      DIMENSION YT(50),FT(50),I300(50),I310(50),I320(50),NN(50)         11730
      DIMENSION FXSAVE(50),YXSAVE(50)                                   11740
      DATA NN/50*2/,I300/50*0/,I310/50*0/,I320/50*0/                    11750
C                                                                       11760
      IF(ND-2) 100,200,300                                              11770
  100 FX=FD(1)                                                          11780
      RETURN                                                            11790
  200 FX=FD(1)+(YX-YD(1))*(FD(2)-FD(1))/(YD(2)-YD(1))                   11800
      RETURN                                                            11810
  300 IF(NFLAG.EQ.1) GO TO 301                                          11820
      YXSAVE(N)=YD(1)                                                   11830
      FXSAVE(N)=FD(1)                                                   11840
      NN(N)=2                                                           11850
      I300(N)=0                                                         11860
      I310(N)=0                                                         11870
      I320(N)=0                                                         11880
      LINTRP(N)=0                                                       11890
  301 CONTINUE                                                          11900
      IF(YX.GE.YD(2)) GO TO 310                                         11910
      IF(I300(N).EQ.1) GO TO 305                                        11920
      YT(N)=2.*YD(1)-YD(2)                                              11930
      FT(N)=2.*FD(1)-FD(2)                                              11940
      I300(N)=1                                                         11950
  305 A(1)=YT(N)                                                        11960
      A(2)=YD(1)                                                        11970
      A(3)=YD(2)                                                        11980
      A(4)=YD(3)                                                        11990
      Y(1)=FT(N)                                                        12000
      Y(2)=FD(1)                                                        12010
      Y(3)=FD(2)                                                        12020
      Y(4)=FD(3)                                                        12030
      GO TO 350                                                         12040
  310 IF(YX.LE.YD(ND-1)) GO TO 320                                      12050
      IF(I310(N).EQ.1) GO TO 315                                        12060
      NN(N)=ND                                                          12070
      ND1=ND-1                                                          12080
      ND2=ND-2                                                          12090
      YT(N)=2.*YD(ND)-YD(ND1)                                           12100
      FT(N)=2.*FD(ND)-FD(ND1)                                           12110
      I310(N)=1                                                         12120
  315 ND1=ND-1                                                          12130
      ND2=ND-2                                                          12140
      A(1)=YD(ND2)                                                      12150
      A(2)=YD(ND1)                                                      12160
      A(3)=YD(ND)                                                       12170
      A(4)=YT(N)                                                        12180
      Y(1)=FD(ND2)                                                      12190
      Y(2)=FD(ND1)                                                      12200
      Y(3)=FD(ND)                                                       12210
      Y(4)=FT(N)                                                        12220
      GO TO 350                                                         12230
  320 N9=NN(N)                                                          12240
      IF(YX.GT.YD(N9)) I320(N)=0                                        12250
      IF(I320(N).EQ.1) GO TO 325                                        12260
      NN(N)=NN(N)+1
      LINTRP(N)=0
      I320(N)=1
  325 DO 326 I=1,4
      J=NN(N)-3+I
      A(I)=YD(J)
  326 Y(I)=FD(J)
C
  350 FX=XLGRNG(4,A,Y,YX)
      J=NN(N)
      JM1=J-1
      IF(FX.GT.AMAX1(FD(J),FD(JM1)).OR.FX.LT.AMIN1(FD(J),FD(JM1)))
     1  GO TO 400
      TNEW=FX-FXSAVE(N)
      TCOMP=FD(J)-FD(JM1)
      IF((TNEW.GT.0..AND.TCOMP.LT.0.).OR.(TNEW.LT.0..AND.TCOMP.GT.0.))
     1  GO TO 400
      IF(LINTRP(N).EQ.0) GO TO 500
  400 FX=FXSAVE(N)+(YX-YXSAVE(N))*(FD(J)-FXSAVE(N))/(YD(J)-YXSAVE(N))
      LINTRP(N)=1
  500 YXSAVE(N)=YX
      FXSAVE(N)=FX
      RETURN
      END
```

```
FUNCTION XLGRNG     76/76   OPT=1                  FTN 4.6+439        08/10/79  15.54.348       PAGE     1

              FUNCTION XLGRNG(N,A,Y,X)                                       12510
C                                                                            12520
              DIMENSION A(N),Y(N)                                            12530
C                                                                            12540
              SUM=0                                                          12550
              E=1                                                            12560
              F=1                                                            12570
              I=1                                                            12580
          100 E=E*(X-A(I))/F                                                 12590
              J=1                                                            12600
              PROD=1                                                         12610
          105 IF(I.NE.J) GO TO 110                                           12620
              J=J+1                                                          12630
          110 IF(J.GT.N) GO TO 120                                           12640
              PROD=PROD*(X-A(J))/(A(I)-A(J))                                 12650
              J=J+1                                                          12660
              GO TO 105                                                      12670
          120 Z=Y(I)*PROD                                                    12680
              SUM=SUM+Z                                                      12690
              IF(I.GE.N) GO TO 200                                           12700
              I=I+1                                                          12710
              F=F+1                                                          12720
              GO TO 100                                                      12730
          200 XLGRNG=SUM                                                     12740
              RETURN                                                         12750
              END                                                            12760
```

```
      SUBROUTINE CHECK(STPCOD)                                          12770
C                                                                       12780
      COMMON /MISC/ XBEG,XEND,TBEG,TEND,IOUT,DCOUNT,DIST(10),KDIST      12790
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              12800
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF               12810
      COMMON /PLOTS/ STIMEA(100),STIMEP(100),SPLMC(40,100),SAMBC(40,100) 12820
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         12830
      COMMON /INPUT4/ MODE1,MODE2,MODE3                                 12840
      COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            12850
      COMMON /GEOM2/ RFACC(10),RFACB(11),RADFAC(10),WFAC(10)            12860
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           12870
     1,UNCOLD(40,10)                                                    12880
      COMMON /UPDAT/ WIND,FRAD,FMIX,FK1,SIGY,SIGZ                       12890
      COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT   12900
      COMMON /TIME/ TINCR1,TINCR2,TCNT1,TCNT2                           12910
      COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                          12920
C                                                                       12930
      INTEGER STPCOD                                                    12940
      DATA IFLAG/0/,IFLAG1/0/                                           12950
      DATA IHELP/0/                                                     12960
C                                                                       12970
      IF(MCODE.EQ.2) GO TO 200                                          12980
C                                                                       12990
C     SAVE CONCENTRATIONS FOR PLOTS (MODE2=3 AND KAMBNT=1)              13000
C                                                                       13010
      IF(MODE2.NE.3.OR.KAMBNT.NE.1) GO TO 5                             13020
      IF(TIME.LT.TCNT2) GO TO 999                                       13030
      II=II+1                                                           13040
      TCNT2=TCNT2+TINCR2                                                13050
      DO 4 NF=1,NFLW                                                    13060
      I=IAMSP(NF)                                                       13070
    4 SAMBC(I,II)=C(I,1)                                                13080
      STIMEA(II)=TIME                                                   13090
      GO TO 999                                                         13100
C                                                                       13110
    5 IF(IOUT.EQ.2.AND.KAMBNT.NE.1) GO TO 20                            13120
C                                                                       13130
    9 IF(TIME+H.LT.TCNT1) GO TO 999                                     13140
   10 IF(IFLAG.EQ.1) GO TO 100                                          13150
      H=TCNT1-TIME                                                      13160
      JSTART=-1                                                         13170
      MCODE=1                                                           13180
      IFLAG=1                                                           13190
      GO TO 999                                                         13200
   20 IF(IFLAG.EQ.1) GO TO 100                                          13210
      IF(FETCH+H*WIND*60..LT.DCOUNT) GO TO 999                          13220
      H=(DCOUNT-FETCH)/(WIND*60.)                                       13230
      JSTART=-1                                                         13240
      MCODE=1                                                           13250
      IFLAG=1                                                           13260
      KDIST=KDIST+1                                                     13270
      DCOUNT=DIST(KDIST)                                                13280
      GO TO 999                                                         13290
C                                                                       13300
C SAVE CONCENTRATIONS FOR PLOTS (MODE2=1,MODE2=2,MODE2=3 AND            13310
C KAMBNT=2)                                                             13320
C                                                                       13330
```

```
  100 II=II+1
      TCNT1=TCNT1+TINCR1
      IF(KAMBNT.NE.1) GO TO 120
      IF(MODE2.NE.1) GO TO 200
      DO 104 NF=1,NFLW
      I=IAMSP(NF)
  104 SAMBC(I,II)=C(I,1)
      STIMEA(II)=TIME
      CALL OUTPUT(2)
      IFLAG=0
      GO TO 999
  120 CALL DEVCON(NTOT,1,YAV,C,NCELLS,WFAC,NFLAG,YIN)
      DO 121 I=1,NTOT
  121 SPLMC(I,II)=YAV(I)
      STIMEP(II)=TIME
C
  200 IFLAG=0
      IF(KAMBNT.EQ.2) CALL OUTPUT(1)
C
  999 IF(TIME+0.1*H.GE.TEND.OR.FETCH.GE.XEND) STPCOD=1
C
      RETURN
      END
      SUBROUTINE OUTPUT(ITYPE)                                          13570
C                                                                       13580
      COMMON /UPDAT/ WIND,FRAD,FMIX,FK1,SIGY,SIGZ                       13590
      COMMON /SAVEIT/ ISAVE                                             13600
      COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            13610
      COMMON /SINDEX/ IAERS,L1,L2,L4                                    13620
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           13630
     1,UNCOLD(40,10)                                                    13640
      COMMON /GEOM1/ HT(10),W(10),RC(10),RB(11),HAM,HAP                 13650
      COMMON /INPUT3/ NMIX,NRAD,NKIT,NAMB,NWIND                         13660
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              13670
      COMMON /DFSVTY/ ZKH(11)                                           13680
      COMMON /PLOTS/ STIMEA(100),STIMEP(100),SPLMC(40,100),SAMBC(40,100)13690
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,I1,HALF               13700
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         13710
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,13720
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    13730
     2,MAXSTAB                                                          13740
      COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT   13750
      COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                          13760
      DIMENSION DASH(132),ZKH60(11)                                     13770
      DATA DASH/132*1H-/                                                13780
C                                                                       13790
      IF(ISAVE.EQ.1) WRITE(NDISK) ITYPE                                 13800
      YIN(IAERS)=YIN(IAERS)*3500.                                       13810
      YAV(IAERS)=YAV(IAERS)*3500.                                       13820
      DO 5 NC=1,NCELLS                                                  13830
    5 C(IAERS,NC)=C(IAERS,NC)*3500.                                     13840
C                                                                       13850
      GO TO (100,200,300,400) ITYPE                                     13860
C                                                                       13870
  100 WRITE(NOUT,1050)                                                  13880
      WRITE(NOUT,1000) TIME,FRAD,SIGY,WIND                              13890
      GO TO (110,120,130) IPHASE                                        13900
  110 WRITE(NOUT,1010) FETCH,FMIX,SIGZ,FK1                              13910
      GO TO 150                                                         13920
  120 WRITE(NOUT,1020) FETCH,FMIX,FK1                                   13930
      GO TO 150                                                         13940
  130 WRITE(NOUT,1030) FETCH,FMIX,FK1                                   13950
  150 WRITE(NOUT,1051)                                                  13960
      WRITE(NOUT,1001)                                                  13970
      DO 160 I=1,NTOT                                                   13980
      DIF=YAV(I)-YIN(I)                                                 13990
  160 WRITE(NOUT,1002) I,NAME(I),STYPE(I),YIN(I),YAV(I),DIF             14000
     1, (C(I,J),J=1,NCELLS)                                             14010
      WRITE(NOUT,1008)                                                  14020
      WRITE(NOUT,1005) (HT(J),J=1,NCELLS)                               14030
      WRITE(NOUT,1004) (W(J),J=1,NCELLS)                                14040
      WRITE(NOUT,1007) (RC(J),J=1,NCELLS)                               14050
      WRITE(NOUT,1006) (RB(J),J=1,NCL1)                                 14060
      DO 170 J=1,NCL1                                                   14070
  170 ZKH60(J)=ZKH(J)/60.                                               14080
      WRITE(NOUT,1003) (ZKH60(J),J=1,NCL1)                              14090
C                                                                       14100
C     OUTPUT TO DISK IF ISAVE=1                                         14110
C                                                                       14120
      IF(ISAVE.NE.1) GO TO 999                                          14130
      WRITE(NDISK) TIME,FRAD,SIGY,WIND,IPHASE
      IF(IPHASE.EQ.1) WRITE(NDISK) FETCH,FMIX,SIGZ,FK1
      IF(IPHASE.NE.1) WRITE(NDISK) FETCH,FMIX,FK1
      WRITE(NDISK) (I,NAME(I),STYPE(I),YIN(I),YAV(I),(C(I,J)
     1,J=1,NCELLS),I=1,NTOT)
      WRITE(NDISK) (HT(J),W(J),RC(J),J=1,NCELLS)
      WRITE(NDISK) (RB(J),ZKH(J),J=1,NCL1)
      GO TO 999
C
  200 WRITE(NOUT,1050)
      WRITE(NOUT,1051)
      WRITE(NOUT,2000) TIME,FRAD,FMIX,FK1
      WRITE(NOUT,2001)
      WRITE(NOUT,2002) (I,NAME(I),C(I,1),I=1,NDIF)
      IF(NSTS.EQ.0) GO TO 205
      N1=NDIF+1
      N2=NDIF+NSTS
      WRITE(NOUT,2003)
      WRITE(NOUT,2002) (I,NAME(I),C(I,1),I=N1,N2)
  205 IF(NUNC.EQ.0) GO TO 210
      N1=NDIF+NSTS+1
      N2=NDIF+NSTS+NUNC
      WRITE(NOUT,2004)
      WRITE(NOUT,2002) (I,NAME(I),C(I,1),I=N1,N2)
  210 IF(NINT.EQ.0) GO TO 215
      N1=NDIF+NSTS+NUNC+1
      N2=NDIF+NSTS+NUNC+NINT
      WRITE(NOUT,2005)
      WRITE(NOUT,2002) (I,NAME(I),C(I,1),I=N1,N2)
  215 WRITE(NOUT,2006)
C
C     OUTPUT TO DISK IF ISAVE=1
C
      IF(ISAVE.NE.1) GO TO 999
      WRITE(NDISK) TIME,FRAD,FMIX,FK1
      WRITE(NDISK) (I,NAME(I),C(I,1),I=1,NTOT)
      GO TO 999
C
  300 WRITE(NOUT,3000) (STIMEA(I),I=1,10)
      DO 310 NF=1,NFLW
      I=IAMSP(NF)
  310 WRITE(NOUT,3001) IAMSP(NF),NAME(I),(SAMBC(I,J),J=1,10)
C
C     OUTPUT TO DISK IF ISAVE=1
C
      IF(ISAVE.NE.1) GO TO 999
      WRITE(NDISK) (STIMEA(I),I=1,NAMB)
      DO 315 NF=1,NFLW
      I=IAMSP(NF)
  315 WRITE(NDISK) IAMSP(I),NAME(I),(SAMBC(I,J),J=1,NAMB)
      GO TO 999
C
  400 CALL RESULT(II,NAMB)
      STOP
C
  999 YIN(IAERS)=YY(IAERS)/3500.
      YAV(IAERS)=YAV(IAERS)/3500.
```

```
          DO 998 NC=1,NCELLS                                                    14710
      998 C(IAERS,NC)=C(IAERS,NC)/3500.                                         14720
          RETURN                                                                14730
    C                                                                           14740
    C OUTPUT FORMATS                                                            14750
    C                                                                           14760
     1050 FORMAT(1H1,132(1H-))                                                  14770
     1051 FORMAT(1X,26HAERS CONC. IN MICRO-G/M**3)                              14780
     1000 FORMAT(8H0 TIME= ,1PE8.2,5H MIN.,9X,13HPLUME WIDTH= ,1PE9.3           14790
         1,3H M.,5X,9HSIGMA Y= ,1PE9.3,3H M.,5X,12HWIND SPEED= ,1PE8.2          14800
         2,6H M/SEC)                                                            14810
     1001 FORMAT(1H0,/1H0,78X,5HCELLS,/23X                                      14820
         1,5HPLUME,4X,6HPLUME-,6X,89(1H-),/3X,18HSPECIES     AMBIENT,3X         14830
         2,4HAVE.,6X,3HAMB,10X,1H1,8X,1H2,8X,1H3,8X,1H4,8X,1H5,8X               14840
         3,1H6,8X,1H7,8X,1H8,8X,1H9,7X,2H10,/1X)                                14850
     1002 FORMAT(1X,I2,1X,A4,2H (,A1,1H),2(1PE9.2),1PE11.3,2X                   14860
         1,10(1PE9.2))                                                          14870
     1003 FORMAT(1X,20HDIFFUSIVITIES (M2/S),1X,11(1PE10.2))                     14880
     1004 FORMAT(6X,15HCELL WIDTHS (M),5X,10(1PE10.2))                          14890
     1005 FORMAT(6X,15HCELL DEPTHS (M),5X,10(1PE10.2))                          14900
     1006 FORMAT(1H0,1X,19HCELL BOUNDARIES (M),1X,11(1PE10.2))                  14910
     1007 FORMAT(1X,20HCELL CENTERLINES (M),5X,10(1PE10.2))                     14920
     1008 FORMAT(1H0,72X,5HCELLS,/27X,100(1H-),/31X,1H1,9X,1H2,9X,1H3           14930
         1,9X,1H4,9X,1H5,9X,1H6,9X,1H7,9X,1H8,9X,1H9,8X,2H10,/1X)               14940
     1010 FORMAT(8H FETCH= ,1PE8.2,7H METERS,7X,13HPLUME DEPTH= ,               14950
         1  1PE9.3,3H M.,5X,9HSIGMA Z= ,1PE9.3,3H M.,6X                         14960
         2, 11HK1 FACTOR= ,1PE8.2)                                              14970
     1020 FORMAT(10H TEMPORARY)                                                 14980
     1030 FORMAT(8H FETCH= ,1PE8.2,7H METERS,7X,13HPLUME DEPTH= ,               14990
         1  1PE9.3,3H M.,32X,11HK1 FACTOR= ,1PE8.2)                             15000
    C                                                                           15010
     2000 FORMAT(1H0,6HTIME= ,1PE8.2,5H MIN.,11X,12HCELL WIDTH= ,               15020
         11PE9.3,3H M.,11X,12HCELL DEPTH= ,1PE9.3,3H M.,8X                      15030
         2,11HK1 FACTOR= ,1PE8.2,/1H0)                                          15040
     2001 FORMAT(1H0,40HDIFERENTIAL SPECIES CONCENTRATIONS (PPM),               15050
         1/1X,40(1H-),/1H0)                                                     15060
     2002 FORMAT(4(11X,I2,1X,A4,3X,1PE10.3),9X)                                 15070
     2003 FORMAT(1H0,41HSTEADY-STATE SPECIES CONCENTRATIONS (PPM),              15080
         1/1X,41(1H-),/1H0)                                                     15090
     2004 FORMAT(1H0,38HUNCOUPLED SPECIES CONCENTRATIONS (PPM),                 15100
         1/1X,38(1H-),/1H0)                                                     15110
     2005 FORMAT(1H0,43HINERT/CONSTANT SPECIES CONCENTRATIONS (PPM),            15120
         1/1X,43(1H-),/1H0)                                                     15130
     2006 FORMAT(1H0,132(1H-))                                                  15140
     3000 FORMAT(1H1,20X,37HCALCULATED AMBIENT CONCENTRATIONS FOR               15150
         1,41H USE IN THE FOLLOWING PLUME SIMULATION(S),/21X,78(1H-)            15160
         2,/1H0,60X,19HAMBIENT TIMES (MIN),/1X,16HSPECIES  SPECIES              15170
         3,/3X,3HNO.,5X,4HNAME,7X,10(1PE9.2,1X),/1H0)                           15180
     3001 FORMAT(3X,I2,6X,A4,7X,10(1PE10.3))                                    15190
          END                                                                   15200
      SUBROUTINE DFSVTY(RC,FR,C,ZKH,N,TIME)
C
      DIMENSION RC(10),FR(11),C(10),ZKH(11)
C
      DO 100 J=2,N
      IF(N/2+1-J) 150,100,50
   50 ZKH(J)= -C(J-1)*FR(J)*(RC(J)-RC(J-1))/(C(J)-C(J-1))
      GO TO 100
  150 ZKH(J)= -C(J)*FR(J)*(RC(J)-RC(J-1))/(C(J)-C(J-1))
  100 CONTINUE
      ZKH(1)=0.0
      ZKH(N/2+1)=0.0
      ZKH(N+1)=0.0
      RETURN
      END
      SUBROUTINE DIFSUB(NDF,NCL,MHALF,N,T,H,HMIN,HMAX,EPS,MF,MCODE
     1,KFLAG,JSTART,BL,BU,Y,C,HALF)
C
      LEVEL 2,BL,BU
      COMMON /CALLS/ NCDFSB,NCDFFN
      DIMENSION SAV1(400),E(400),Y(N,6),YMAX(400),SAV2(400)
     1,EL(6),TQ(4),PT(5,3),BL(16400),BU(16000),WL(100),WU(300),C(40,10)
      DIMENSION W(100)
      LOGICAL HALF
      DATA PT/2*1.,.25,.0278,.001736,4.,20.25,53.78,108.6,187.,9.,36.,84
     *.03,156.3,1./,BG/1.E20/,D1/0.0/,EL(2)/1.0/
      IF(MCODE.NE.2) GO TO 5
      NCDFSB=0
    5 NCDFSB=NCDFSB+1
      IF(MCODE.EQ.1) ID=1
      DO 80 I=1,N
      YM=Y(I,1)*Y(I,1)
      IF(YM.EQ.0.)YMAX(I)=1.E30
      IF(YM.NE.0.)YMAX(I)=AMIN1(1.E30,1./YM)
   80 CONTINUE
      KFLAG =0
      TOLD=T
      IF(JSTART)160,90,200
   90 CALL DIFFUN(C,N,T,Y,SAV1)
      ND=2*NDF+NDF+2
      UROUND=7.1E-15
      EPSJ=SQRT(UROUND)
      D1=EPS
      CRATE=1.0
      OLDL0=1.0
      HOLD=H
      IRET=1
      NCLL2=NCL*2+1
      NQ = 1
      NSTEP=0
      N0=400
      MDIM=NDF
      MDIM1=MDIM+1
      MDIMN=MDIM1*N
      NMDIM=N*MDIM
      NSQ=N0*(N-1)+1
      DO 110 I=1,N
  110 Y(I,2)=H*SAV1(I)
      L=2
      IDOUB=3
      RMAX=1.E4
      RC=0.
  130 GOTO(201,202,203,204,205),NQ
  201 EL(1)=1.
      GO TO 900
  202 EL(1)=6.6666666666667E-01
      EL(3)=3.3333333333333E-1
      GO TO 900
  203 EL(1)=5.4545454545455E-1
      EL(3) = EL(1)
      EL(4)=9.0909090909091E-2
      GOTO900
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 204 EL(1)=.48
     EL(3)=.7
     EL(4)=.2
     EL(5)=.02
     GO TO 900
 205 EL(1) = 4.3795620437956E-01
     EL(3)=8.2116788321168E-1
     EL(4) = 3.1021897810219E-01
     EL(5)=5.4744525547445E-2
     EL(6) = 3.6496350364964E-03
 900 P=EPS*EPS*FLOAT(N)
     DO 910 K=1,3
     TQ(K)=PT(NQ,K)*P
 910 CONTINUE
     TQ(4)=.25*TQ(2)/FLOAT((NQ+2)**2)
     RC=RC*EL(1)/OLDL0
     OLDL0=EL(1)
     GOTO(160,170,200),IRET
 160 IF(H.EQ.HOLD)GOTO 200
     RH=H/HOLD
     H=HOLD
     IREDO=3
     GOTO 175
 170 RH = AMAX1(RH,HMIN/ABS(H))
 175 RH=AMIN1(RH,HMAX/ABS(H),RMAX)
     R1=1.
     DO 180 J=2,L
     R1=R1*RH
     DO 180 I=1,N
 180 Y(I,J)=Y(I,J)*R1
     H=H*RH
     RC=RC*RH
     IDOUB=L+1
     IF(ID.EQ.0)GOTO 690
 200 T=T+H
     IF(ABS(RC-1.).GT.0.3.OR.NSTEP.GE.20) IWEVAL=MF
     DO 210 J1=1,NQ
     DO 210 J2=J1,NQ
     J=NQ-J2+J1
     DO 210 I=1,N
 210 Y(I,J)=Y(I,J)+Y(I,J+1)
 220 DO 230 I = 1,N
 230 E(I)=0.
     M=0
     CALL DIFFUN(C,N,T,Y,SAV2)
     IF(IWEVAL.LE.0)GOTO 350
     IWEVAL =0
     RC=1.
     NSTEP=0
     CON=-H*EL(1)
     CALL PDB(N0,N,NDF,NCL,BL,BU,Y,MDIM,MDIM1)
     DO 10 I=1,MDIMN
  10 BL(I)=BL(I)*CON
     DO 11 I=1,NMDIM
  11 BU(I)=BU(I)*CON
     J=1
     DO 70 I=1,N
```

```
      BL(J)=BL(J)+1.
   70 J=J+MDIM1
      RC=1.
      CALL LBLU(MDIM,N,MHALF,BL,BU,WL,WU,IER)
      IF(IER) 420,350,420
  350 DO360 I=1,N
  360 SAV1(I)=H*SAV2(I)-Y(I,2)-E(I)
      CALL LBSOL(MDIM,N,MHALF,SAV1,BL,BU,W,SAV1)
  370 D=0.
      IM=0
      CHECKM=0.
      DO 380 I=1,N
      E(I)=E(I)+SAV1(I)
      CHECK=YMAX(I)*SAV1(I)*SAV1(I)
      D=D+CHECK
      IF(CHECK.GT.CHECKM) IM=I
      IF(CHECK.GT.CHECKM) CHECKM=CHECK
  380 SAV1(I)=Y(I,1)+EL(1)*E(I)
  400 IF(M.NE.0) CRATE=AMAX1(.9*CRATE,D/D1)
      IF((D*AMIN1(1.,2.*CRATE))
     *.LE.TQ(4)) GOTO 450
      D1=D
      M=M+1
      IF(M.EQ.3) GOTO 410
      CALL DIFFUN(C,N,T,SAV1,SAV2)
      GO TO 350
  410 IF(IWEVAL.EQ.-1) GOTO 440
  420 T=TOLD
      RMAX=2.
      DO 430 J1=1,NQ
      DO 430 J2=J1,NQ
      J=NQ-J2+J1
      DO 430 I=1,N
  430 Y(I,J)=Y(I,J)-Y(I,J+1)
      IF(ABS(H).LE.(HMIN*1.00001))GOTO 680
      RH=.25
      ID=1
      GOTO 170
  440 IWEVAL=MF
      GOTO 220
  450 IF(MF.NE.0) IWEVAL=-1
      D=0.
      DO 460 I=1,N
  460 D=D+YMAX(I)*E(I)**2
      IF(D.GT.TQ(2)) GOTO 500
      KFLAG=0
      ID=0
      NSTEP=NSTEP+1
      DO 470 J=1,L
      DO 470 I=1,N
      Y(I,J)=Y(I,J)+EL(J)*E(I)
      IF(Y(I,1).LT.0.0) Y(I,1)=0.0
  470 CONTINUE
      IF(IDOUB.EQ.1) GOTO 520
      IDOUB=IDOUB-1
      IF(IDOUB.GT.1.OR.NQ.EQ.5) GOTO 700
      DO 490 I=1,N
  490 Y(I,6)=E(I)
      GOTO 700
  500 KFLAG=KFLAG-1
      T=TOLD
      DO 510 J1=1,NQ
      DO 510 J2=J1,NQ
      J=NQ-J2+J1
      DO 510 I=1,N
      Y(I,J)=Y(I,J)-Y(I,J+1)
  510 CONTINUE
      RMAX=2.
      IF(ABS(H).LE.(HMIN*1.00001))GOTO 660
      IF (KFLAG.LE.-3) GO TO 640
      PR3=BC
      ID=2
      GOTO 540
  520 PR3=BC
      IF(NQ.EQ.5)GOTO 540
      D1=0.
      DO 530 I=1,N
  530 D1=D1+YMAX(I)*(E(I)-Y(I,6))**2
      PR3=((D1/TQ(3))**(.5/FLOAT(L+1)))*1.4+1.4E-6
  540 PR2=((D/TQ(2))**(.5/FLOAT(L)))*1.2+1.2E-6
      PR1=BC
      IF (NQ.EQ.1) GO TO 560
      D=0.
      DO 550 I=1,N
  550 D=D+YMAX(I)*Y(I,L)**2
      PR1=((D/TQ(1))**(.5/FLOAT(NQ))+1.E-6)*1.3
  560 IF(PR2.LE.PR3) GOTO 570
      IF(PR1-PR3)580,580,590
  570 IF (PR2.GT.PR1) GO TO 580
      NEWQ=NQ
      RH=1./PR2
      GOTO 620
  580 NEWQ = NQ - 1
      RH=1./PR1
      GOTO 620
  590 NEWQ=L
      RH=1./PR3
      IF(RH.LT.1.1)GOTO 610
      DO 600 I=1,N
  600   Y(I,NEWQ+1) = E(I)*EL(L)/FLOAT(L)
      GOTO 630
  610 IDOUB = 10
      GOTO 700
  620 IF ((KFLAG.EQ.0).AND.(RH.LT.1.1)) GO TO 610
      IF (NEWQ.EQ.NQ) GO TO 170
  630 NQ=NEWQ
      L=NQ+1
      IRET=2
      GOTO130
  640 IF(KFLAG.EQ.-9)GOTO 670
      RH=10.**KFLAG
      RH=AMAX1(HMIN/ABS(H),RH)
      H=H*RH
      CALL DIFFUN(C,N,T,Y,SAV1)
      DO 650 I=1,N                                                       17640
  650 Y(I,2) = H*SAVI(I)                                                 17650
      IWEVAL=MF                                                          17660
      IDOUB=10                                                           17670
      RMAX=1.E4                                                          17680
      IF(NQ.EQ.1)GOTO 200                                                17690
      NQ=1                                                               17700
      L=2                                                                17710
      IRET=3                                                             17720
      GOTO 130                                                           17730
  660 KFLAG = -1                                                         17740
      GOTO 700                                                           17750
  670 KFLAG = -2                                                         17760
      GOTO 700                                                           17770
  680 KFLAG = -3                                                         17780
      GOTO 700                                                           17790
  690 RMAX = 10.                                                         17800
  700 HOLD=H                                                             17810
C       WRITE(6,3000) H,T,Y(3,1),Y(4,1),Y(5,1),Y(6,1)                    17820
C 3000 FORMAT(* H=*,1PE10.3,* T=*,1PE10.3,* Y-3,4,5,6=*,4(1PE12.5))       17830
      JSTART=NQ                                                          17840
      DO 710 II=1,NDF                                                    17850
      DO 710 NC=1,NCL                                                    17860
      I=(NC-1)*NDF+II                                                    17870
      IF(Y(I,1).GE.0.) GO TO 709                                         17880
      DO 708 J=1,6                                                       17890
  708 Y(I,J)=0.                                                          17900
      E(I)=0.                                                            17910
  709 C(II,NC)=Y(I,1)                                                    17920
      IF(HALF) C(II,NCLL2-NC)=C(II,NC)                                   17930
  710 CONTINUE                                                           17940
      RETURN                                                             17950
      END                                                                17960
      SUBROUTINE DIFFUN(C,N0,T, Y, YDOT)
C                                                                       17970
C DECLARE INPUTS FROM DIFSUB TO BE DOUBLE PRECISION WITH DIMENSIONS     17980
C                                                                       17990
      DIMENSION Y(N0), YDOT(N0), C(40,10)                               18000
C                                                                       18010
C DEFINE VARIABLES AND DIMENSIONS OF COMMON STORAGE WITH MODKIN         18020
C                                                                       18030
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         18040
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  18050
     1,SRK(99)                                                          18060
      COMMON /CHEM2/ KRXN(99,40),KCOF(99,40),KPRD(4,99),KRCT(4,99)      18070
      COMMON /GEOM1/ HT(10),W(10),RC(10),RB(11),HAM,HAP                 18080
      COMMON /GEOM3/ DEFNW,FACTR                                        18090
      COMMON /DFSVTY/ ZKH(11)                                           18100
      COMMON /COEFFS/ KALPHA(10),KBETA(10)                              18110
      COMMON /TERMS1/ TEL1(10),TEL2(10),TER1(10),TER2(10),TU1(10)       18120
     1,TU2(10),TDN1(10),TDN2(10),TQ(10),TDR1(10),TDR2(10),TDL1(10)      18130
     2,TDL2(10),TDIVL(10),TDIVR(10),TDIV(10)                            18140
      COMMON /TERMS2/ ENTLAT(40,10),ENTVRT(40,10),DEPOSN(40,10)         18150
     1,SOURCE(40,10),DILUTN(40,10),DIFUSN(40,10),CMSTRY(40,10)          18160
      COMMON /RATE1/ Q(10),FHT(10),FR(11),QW,FVDL(10)                   18170
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              18180
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           18190
     1,UNCOLD(40,10)                                                    18200
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,18210
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    18220
     2,MAXSTAB                                                          18230
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF               18240
      COMMON /CONTRL/ BSTART,HMIN,HMAX,EPS,TOL                          18250
      COMMON /GROUND/ VDEP(40),VSORCE(40),YGRND(40)                     18260
      COMMON /CALLS/ NCDFSB,NCDFFN                                      18270
C                                                                       18280
C DEFINE MISCELLANEOUS DATA VALUES                                      18290
C                                                                       18300
      DATA NTRY/75/,NWARN/0/                                            18310
      DATA IPP/0/,NTTT/0/                                               18320
C                                                                       18330
      IF(NTTT.EQ.1) GO TO 1                                             18340
      NCDFFN=0                                                          18350
      NTTT=1                                                            18360
C                                                                       18370
C MOVE DIFFERENTIAL CONCENTRATIONS TO LOCAL ARRAY                       18380
C                                                                       18390
    1 NCDFFN=NCDFFN+1                                                   18400
C                                                                       18410
      CALL RATES(T)                                                     18420
C                                                                       18430
      DO 350 NC=1,NC5                                                   18440
      N9=(NC-1)*NDIF                                                    18450
      DO 110 J=1,NDIF                                                   18460
      JJ=(NC-1)*NDIF+J                                                  18470
      YAX(J)=AMAX1(0.0,Y(JJ))                                           18480
  110 CONTINUE                                                          18490
      NDF1=NDIF+1                                                       18500
      DO 111 J=NDF1,NTOT                                                18510
  111 YAX(J)=C(J,NC)                                                    18520
                                                                        18530
```

```
C
C SET ITERATION LOOP AND CALCULATE REACTION RATES
C
      DO 260 N = 1,NTRY
      DO 140 L = 1,NRXN
      RATE = RK(L)
      DO 120 K = 1,MAXRCT
      J = KRCT(K,L)
      IF (J .EQ. 0) GO TO 130
      RATE = RATE * YAX(J)
  120 CONTINUE
  130 R(L,NC) = RATE
  140 CONTINUE
C
C SET CONVERGENCE COUNTER AND BEGIN STEADY-STATE CALCULATION LOOP
C
      NCNV = 0
      IF (NSTS .LE. 0) GO TO 255
      DO 250 M = 1,NSTS
      SDEN = Q(NC)
      SNUM = 0.0
      NS = NDIF + M
      STEST = YAX(NS)
C
C IDENTIFY STEADY STATE SPECIES IN REACTION
C
      DO 230 L = 1,NRXN
      J = KCOF(L,NS)
      K = KRXN(L,NS)
C
C SKIP OVER LUMPED MECHANISM REPLACEMENT SPECIES
C
      IF (K .GT. NRXN) GO TO 230
      IF (J) 205, 235, 203
C
C CALCULATE NUMERATOR OF STEADY STATE EQUATION
C
  203 SNUM = SNUM + R(K,NC) * COEFF(J,K)
      GO TO 230
C
C START REACTION RATE CALCULATION AND SET SPECIES FLAG
C
  205 RATE = RK(K)
      JFLAG = 0
      DO 210 NR = 1,MAXRCT
      J = KRCT(NR,K)
      IF (J .EQ. 0) GO TO 220
      IF (J .NE. NS) GO TO 208
C
C CALCULATE RATE, SKIPPING FIRST OCCURRENCE OF SPECIES IN REACTION
C
      IF (JFLAG .EQ. 1) GO TO 208
      JFLAG = 1
      GO TO 210
  208 RATE = RATE * YAX(J)
  210 CONTINUE
C
```

```
C CALCULATE DENOMINATOR OF STEADY STATE EQUATION
C
  220 SDEN = SDEN + RATE
  230 CONTINUE
C
C TEST VALUES FOR ZERO -- SKIP CONVERGENCE TEST IF SO
C
  235 IF (SDEN .LE. 0.0) GO TO 240
      IF (SNUM .LE. 0.0) GO TO 240
C
C CALCULATE STEADY-STATE CONCENTRATION AND CHECK FOR CONVERGENCE
C
      STEST = SNUM / SDEN
      IF (ABS((STEST - YAX(NS)) / STEST) .GT. TOL) GO TO 245
C
C UPDATE CONVERGENCE COUNTER AND SPECIES CONCENTRATION
C
  240 NCNV = NCNV + 1
  245 YAX(NS) = STEST
      C(NS,NC)=STEST
  250 CONTINUE
C
C TEST FOR CONVERGENCE OF ALL STEADY-STATES -- WRITE MESSAGE IF FAILED
C
  255 IF (NCNV .EQ. NSTS) GO TO 300
  260 CONTINUE
      WRITE (NOUT,1031) NTRY,NS
 1031 FORMAT (* STEADY STATE FAILED TO CONVERGE IN *, I3,
     +  * ITERATIONS. SPECIES= NO.*,I3)
C
C INCREMENT WARNING COUNTER AND STOP IF TOO MANY
C
      NWARN = NWARN + 1
      IF (NWARN .GT. NTRY) STOP
  300 CONTINUE
C
C     ESTABLISH TERMS OF DIFFERENTIAL EQUATION
C
C
C
      HW=BT(NC)*W(NC)
      TQ(NC)=-Q(NC)
      IF(KAMBNT.EQ.1) GO TO 80
      IF(NC.GT.1) GO TO 50
      HM=HAM
      RM=RC(1)-FACTR*W(1)
      RP=RC(2)
      GO TO 70
   50 IF(NC.LT.NCELLS) GO TO 60
      HP=HAP
      RP=RC(NCELLS)+FACTR*W(NCELLS)
      RM=RC(NC-1)
      GO TO 70
   60 HM=BT(NC-1)
      HP=BT(NC+1)
      RM=RC(NC-1)
      RP=RC(NC+1)
   70 TEL1(NC)= -(KALPHA(NC)-1)*BT(NC)*FR(NC+1)/HW
```

```
      TEL2(NC)= (KALPHA(NC)-1)*HM*FR(NC)/HW
      TER1(NC)= -KALPHA(NC)*HT(NC)*FR(NC)/HW
      TER2(NC)= KALPHA(NC)*HP*FR(NC+1)/HW
      TU1(NC)= KBETA(NC)*W(NC)*FHT(NC)/HW
      TU2(NC)= -(KBETA(NC)-1)*W(NC)*FHT(NC)/HW
      TDN1(NC)= -W(NC)/HW
      TDN2(NC)= W(NC)/HW
      TDR1(NC)= -ZKH(NC+1)/(W(NC)*(RP-RC(NC)))
      TDR2(NC)= ZKH(NC+1)/(W(NC)*(RP-RC(NC)))
      TDL1(NC)= -ZKH(NC)/(W(NC)*(RC(NC)-RM))
      TDL2(NC)= ZKH(NC)/(W(NC)*(RC(NC)-RM))
      TDIVL(NC)=-(KALPHA(NC)-1)*(1.-FVDL(NC))*QW
      TDIVR(NC)=KALPHA(NC)*(1.-FVDL(NC))*QW
      TDIV(NC)=-QW
C
C CALCULATE RATE OF CHANGE OF CONCENTRATION FOR DIFFERENTIAL SPECIES
C
   80 DO 330 M=1,NDIF
      YCALC = 0.0
      DO 310 L = 1,NRXN
      J = KCOF(L,M)
      K = KRXN(L,M)
C
C SKIP OVER LUMPED MECHANISM REPLACEMENT SPECIES
C
      IF (K .GT. NRXN) GO TO 310
      IF (J) 305, 320, 307
  305 YCALC = YCALC - R(K,NC)
      GO TO 310
  307 YCALC = YCALC + R(K,NC) * COEFF(J,K)
  310 CONTINUE
  320 IF(KAMBNT.EQ.1) GO TO 329
      IF(NC.GT.1) GO TO 322
      YP=Y(NDIF+M)
      YM=YAML(M)
      GO TO 326
  322 IF(NC.LT.NCELLS) GO TO 324
      YP=YAMR(M)
      YM=Y((NC-2)*NDIF+M)
      GO TO 326
  324 YP=Y(NC*NDIF+M)
      YM=Y((NC-2)*NDIF+M)
  326 YT=YAMT(M)
      YG=YGRND(M)
C      WRITE(6,7227) M,NC,YP,YM
C 7227 FORMAT(* M=*,I2,* NC=*,I2,* YP=*,O22,* YM=*,O22)
C
C     TERMS OF DIFFERENTIAL EQUATION
C ****** FIRST, YDOT DUE TO LARGE SCALE CONVERGENCE
C
     TERMD=YM*TDIVL(NC)+YP*TDIVR(NC)+YAX(M)*TDIV(NC)+YT*FVDL(NC)*QW
C
C ****** NOW OTHER TERMS
C
     TERM= YAX(M)*(TEL1(NC)+TER1(NC)+TU1(NC)+TDN1(NC)*VDEP(M)+TQ(NC)
    1              +TDR1(NC)+TDL1(NC))
     TERMM= YM*(TEL2(NC)+TDL2(NC))
```

```
      TERMP=  YP*(TER2(NC)+TDR2(NC))                                      20250
      TERMA=  YT*TU2(NC)                                                  20260
      TERMC=  YC*TDN2(NC)*VSORCE(M)                                       20270
      TERMCH=  YCALC                                                      20280
C                                                                         20290
C     RATE OF CHANGE OF Y                                                 20300
C                                                                         20310
      YDOT(M9+M)=  TERM+TERMM+TERMP+TERMA+TERMC+TERMCH+TERMD              20320
C                                                                         20330
      YDENOM=YDOT(M9+M)                                                   20340
      IF(YDENOM.NE.0.)  GO TO 328                                         20350
      ENTLAT(M,NC)=0.0                                                    20360
      ENTVRT(M,NC)=0.0                                                    20370
      DEPOSN(M,NC)=0.0                                                    20380
      SOURCE(M,NC)=0.0                                                    20390
      DILUTN(M,NC)=0.0                                                    20400
      DIFUSN(M,NC)=0.0                                                    20410
      CMSTRY(M,NC)=0.0                                                    20420
      GO TO 330                                                           20430
  328 ENTLAT(M,NC)=  (YAX(M)*(TEL1(NC)+TER1(NC))+YM*TEL2(NC)              20440
     1    +YP*TER2(NC))/YDENOM                                            20450
      ENTVRT(M,NC)=  (YT*TU2(NC)+YAX(M)*TU1(NC))/YDENOM                   20460
      DEPOSN(M,NC)=  YAX(M)*TDN1(NC)*VSORCE(M)/YDENOM                     20470
      SOURCE(M,NC)=  YC*TDN2(NC)*VSORCE(M)/YDENOM                         20480
      DILUTN(M,NC)=  YAX(M)*TQ(NC)/YDENOM                                 20490
      DIFUSN(M,NC)=  (YAX(M)*(TDR1(NC)+TDL1(NC))+YM*TDL2(NC)              20500
     1    +YP*TDR2(NC))/YDENOM                                            20510
      CMSTRY(M,NC)=  TERMCH/YDENOM                                        20520
      GO TO 330                                                           20530
  329 YDOT(M9+M)=YCALC                                                    20540
  330 CONTINUE                                                            20550
  350 CONTINUE                                                            20560
      RETURN                                                              20570
      END                                                                 20580
      SUBROUTINE PDB(N0,N,NDF,NCL,BL,BU,Y,MDIM,MDIM1)                   20590
      LEVEL 2,BL,BU                                                     20600
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF               20610
      COMMON /TERMS1/ TEL1(10),TEL2(10),TER1(10),TER2(10),TU1(10)       20620
     1,TU2(10),TDN1(10),TDN2(10),TQ(10),TDR1(10),TDR2(10),TDL1(10)     20630
     2,TDL2(10),TDIVL(10),TDIVR(10),TDIV(10)                           20640
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         20650
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           20660
     1,UNCOLD(40,10)                                                   20670
      COMMON /GROUND/ VDEP(40),VSORCE(40),YGRND(40)                     20680
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  20690
     1,SRK(99)                                                         20700
      COMMON /CHEM2/ KRXN(99,40),KCOF(99,40),KPRD(4,99),KRCT(4,99)      20710
      DIMENSION BL(MDIM1,N),BU(MDIM,N),Y(N0),RT(4),T4(40,40)            20720
C-----------------------------------------------------------------       20730
C                                                                       20740
C     N0   = DIMENSIONAL PARAMETER,  N0.GE.N.                           20750
C     N    = ORDER OF MATRIX A, N.GE.2.                                 20760
C     NDF  = NUMBER OF DIFFERENTIAL SPECIES                             20770
C     NCL  = NUMBER OF CELLS                                            20780
C     BL,BU ARE ARRAYS USED TO STORE THE MATRIX A (THE JACOBIAN)        20790
C           IN A FORM SUITABLE FOR SOLUTION BY LBLU AND LBSOL           20800
C     Y    = THE LOCAL SPECIES ARRAY                                    20810
C                                                                       20820
      DO 70 J=1,N                                                       20830
      DO 70 I=1,MDIM1                                                   20840
   70 BL(I,J)=0.0                                                       20850
      DO 75 J=1,N                                                       20860
      DO 75 I=1,MDIM                                                    20870
   75 BU(I,J)=0.0                                                       20880
      DO 100 NC=1,NCL                                                   20890
C                                                                       20900
      DO 5 IK=1,NDF                                                     20910
      K=(NC-1)*NDF+IK                                                   20920
      YAX(IK)=Y(K)                                                      20930
      DO 4 IJ=1,NDF                                                     20940
    4 T4(IJ,IK)=0.                                                      20950
    5 CONTINUE                                                          20960
C                                                                       20970
      DO 30 IR=1,NRXN                                                   20980
      DO 9 I=1,4                                                        20990
      IF(KRCT(I,IR).EQ.0) GO TO 10                                      21000
      J=KRCT(I+1-I/4*4,IR)                                              21010
      K=KRCT(I+2-I/3*4,IR)                                              21020
      L=KRCT(I+3-I/2*4+I/4*4,IR)                                        21030
    9 RT(I)=YAX(J)*YAX(K)*YAX(L)*RK(IR)                                 21040
   10 DO 19 K=1,4                                                       21050
      I=KRCT(K,IR)                                                      21060
      IF(I.EQ.0) GO TO 30                                               21070
      IF(I.GT.NDF) GO TO 19                                             21080
      IF(YAX(I).LE.0.0) GO TO 30                                        21090
      DO 18 L=1,4                                                       21100
      J=KRCT(L,IR)                                                      21110
      IF(J.EQ.0) GO TO 20                                               21120
   18 IF(J.LE.NDF) T4(I,J)=T4(I,J)-RT(L)                                21130
   20 DO 17 L=1,4                                                       21140
      J=KPRD(L,IR)                                                      21150
      IF(J.EQ.0) GO TO 19
   17 IF(J.LE.NDF) T4(J,I)=T4(J,I)+RT(K)*COEFF(L,IR)
   19 CONTINUE
   30 CONTINUE
C
C
      DO 100 I=1,NDF
      KV=(NC-1)*NDF+I
      DO 90 J=1,NDF
      KH=(NC-1)*NDF+J
      JL=KH
      IL=KV-KH+1
      ILP=IL+NDF
      IU=KH-KV
      JU=KV
      IUP=IU+NDF
      JLP=JL-NDF
      IF(KH.EQ.KV) GO TO 80
      IF(KV.GT.KH) BL(IL,JL)=T4(I,J)
      IF(KV.LT.KH) BU(IU,JU)=T4(I,J)
      GO TO 90
   80 BL(IL,JL)= TEL1(NC)+TER1(NC)+TU1(NC)+TDN1(NC)*VDEP(I)+TQ(NC)
     1            +TDR1(NC)+TDL1(NC)+T4(I,J)+TDIV(NC)
      IF(KAMBNT.EQ.1) GO TO 90
      IF(NC.NE.1) GO TO 85
      BU(IUP,JU)=TER2(NC)+TDR2(NC)+TDIVR(NC)
      GO TO 90
   85 IF(NC.NE.NCL) GO TO 86
      BL(ILP,JLP)=TEL2(NC)+TDL2(NC)+TDIVL(NC)
      GO TO 90
   86 BU(IUP,JU)=TER2(NC)+TDR2(NC)+TDIVR(NC)
      BL(ILP,JLP)=TEL2(NC)+TDL2(NC)+TDIVL(NC)
   90 CONTINUE
  100 CONTINUE
      RETURN
      END
      SUBROUTINE LBLU(MDIM,N,M,BL,BU,WL,WU,IER)                         21520
      LEVEL 2,BL,BU                                                     21530
      DIMENSION BL(1),BU(1),WL(1),WU(1)                                 21540
C-----------------------------------------------------------------      21550
C                                                                       21560
C     LU DECOMPOSITION OF GENERAL BAND MATRIX A - LARGE MATRIX          21570
C     VERSION  (USE LBSOL TO SOLVE THE CORRESPONDING LINEAR SYSTEM.)    21580
C                                                                       21590
C  REFERENCE.. A. C. HINDMARSH, SOLUTION OF BANDED LINEAR SYSTEMS,      21600
C  LAWRENCE LIVERMORE LABORATORY REPORT UCID-30045, REV. 1, JUNE 1978   21610
C                                                                       21620
C-----------------------------------------------------------------      21630
C                                                                       21640
C     MDIM = DIMENSION PARAMETER FOR BL AND BU.  MDIM.GE.M, MDIM.GE.2.  21650
C     N    = ORDER OF MATRIX A.  N.GE.2.                                21660
C     M    = HALF-BANDWIDTH OF A.  BANDWIDTH = 2*M+1                    21670
C     A(I,J) IS STORED IN BL(I-J+1,J) FOR I.GE.J, AND IN                21680
C        BU(I,J-I) FOR I.LT.J, WHERE                                    21690
C        BL IS (MDIM+1) BY N AND IS STORED COLUMNWISE, AND              21700
C        BU IS N BY MDIM AND IS STORED ROWWISE.                         21710
C        BL AND BU ARE LCM ARRAYS.                                      21720
C     DECOMPOSITION OF A IS OVERWRITTEN ON BL AND BU.                   21730
C     WL IS AN ARRAY FOR WORKING STORAGE, OF LENGTH OF AT LEAST 2*M+4.  21740
C     WU IS AN ARRAY FOR WORKING STORAGE, OF LENGTH OF AT LEAST 2*M+2.  21750
C     IER  = ERROR INDICATOR.                                           21760
C             0- FOR NO ERROR                                           21770
C             K- IF (K,K) ELEMENT OF L VANISHES                         21780
C            -1- IF THE INPUT PARAMETERS ARE INCONSISTANT.              21790
C                                                                       21800
C     MDIM, N, M, BL, BU  ARE INPUT ARGUMENTS.                          21810
C     BL, BU, IER  ARE THE OUTPUT ARGUMENTS.                            21820
C                                                                       21830
C-----------------------------------------------------------------      21840
C                                                                       21850
      IF((N.LT.2).OR.(M.GT.MDIM).OR.(MDIM.LT.2)) GO TO 100              21860
      N1=N-1                                                            21870
      M1DIM=MDIM+1                                                      21880
      MM=M-1                                                            21890
      M1=M+1                                                            21900
      M2=M1+1                                                           21910
      M3=M2+1                                                           21920
      IER=0                                                             21930
C                                                                       21940
C  INITIALIZE STORAGE AND TEST FIRST PIVOT.                             21950
      WU(M1)=0.                                                         21960
      WU(M2)=0.                                                         21970
      CALL READEC(WL(M2),BL,M1)                                         21980
      CALL READEC(WU(M1),BU,M)                                          21990
      K=1                                                               22000
      R=WL(M2)                                                          22010
      IF(R)5,90,5                                                       22020
    5 R=1./R                                                            22030
      WL(M2)=R                                                          22040
      DO 10 J=1,M                                                       22050
   10   WU(M+J)=WU(M+J)*R                                               22060
      DD=WL(M3)*WU(M1)                                                  22070
      LOCL=1                                                            22080
      LOCU=1                                                            22090
C                                                                       22100
C  LOOP OVER K.  (MAIN LOOP)                                            22110
      DO 70 K=2,N1                                                      22120
        KM1=K-1                                                         22130
        KM2=KM1-1                                                       22140
        NMK=N-K                                                         22150
        LOCLJ=LOCL                                                      22160
        LOCL=LOCL+M1DIM                                                 22170
        LOCU=LOCU+MDIM                                                  22180
C                                                                       22190
C  LOAD LOWER PART OF COLUMN K AND UPPER PART OF ROW K.                 22200
        CALL READEC(WL,BL(LOCL),M1)                                     22210
        CALL READEC(WU,BU(LOCU),M)                                      22220
C                                                                       22230
C  TEST FOR ZERO PIVOT                                                  22240
        R=WL(1)-DD                                                      22250
        IF(R)20,90,20                                                   22260
   20   R=1./R                                                          22270
        WL(1)=R                                                         22280
C                                                                       22290
C  FORM MODIFIED A ELEMENTS USING COLUMN K-1 OF L AND ROW K-1 OF U.     22300
        LOCUJ=LOCLJ-KM2                                                 22310
        II=MIN0(NMK,MM)                                                 22320
        BUJK=WU(M1)                                                     22330
        BLJK=WL(M3)                                                     22340
        DO 30 I=1,II                                                    22350
          WL(I+1)=WL(I+1)-WL(M3+I)*BUJK                                 22360
          WU(I)=WU(I)-BLJK*WU(M1+I)                                     22370
   30     CONTINUE                                                      22380
        DD=WL(M3+1)*WU(M2)                                              22390
C                                                                       22400
C  COPY OUT COLUMN K-1 OF L AND ROW K-1 OF U.                           22410
        CALL WRITEC(WL(M2),BL(LOCLJ),M1)                                22420
        CALL WRITEC(WU(M1),BU(LOCUJ),M)                                 22430
C                                                                       22440
C  COPY IN BLOCKS OF L AND U AND COMPLETE MODIFICATION                  22450
C  OF A IN COLUMN/ROW K.                                                22460
        JJ=MIN0(KM1,MM)                                                 22470
      IF(JJ.LT.2) GO TO 55                                              22480
        DO 50 J=2,JJ                                                    22490
          LOCLJ=LOCLJ-M1DIM                                             22500
          LOCUJ=LOCUJ-MDIM                                              22510
          CALL READEC(WL(M2),BL(LOCLJ),M1)                              22520
          CALL READEC(WU(M1),BU(LOCUJ),M)                               22530
          II=MIN0(NMK,M-J)                                              22540
          MJ=M+J                                                        22550
          M2J=M2+J                                                      22560
          BUJK=WU(MJ)                                                   22570
          BLJK=WL(M2J)                                                  22580
          DO 40 I=1,II                                                  22590
            WL(I+1)=WL(I+1)-WL(M2J+I)*BUJK                              22600
            WU(I)=WU(I)-BLJK*WU(MJ+I)                                   22610
   40       CONTINUE                                                    22620
          DD=DD+WL(M2J+1)*WU(MJ+1)                                      22630
   50   CONTINUE                                                        22640
C                                                                       22650
```

```
      C      FINISH COMPUTING ROW K OF U AND COLUMN K OF L.
         55   DO 60 I=1,M                                                  22660
         60     WU(M+I)=WU(I)*R                                            22670
              DO 65 I=1,M1                                                 22680
         65     WL(M1+I)=WL(I)                                             22690
              DD=DD+WL(M3)*WU(M1)                                          22700
         70   CONTINUE                                                     22710
      C                                                                    22720
      C  COPY OUT COLUMN N-1 OF L AND ROW N-1 OF U.                        22730
            K=N                                                            22740
            CALL WRITEC(WL(M2),BL(LOCL),2)                                 22750
            BU(LOCU)=WU(M1)                                                22760
            LOCL=LOCL+M1DIM                                                22770
      C                                                                    22780
      C  TEST FINAL PIVOT AND COPY OUT LAST ELEMENT.                       22790
            R=BL(LOCL)-DD                                                  22800
            IF(R)85,90,85                                                  22810
         85 BL(LOCL)=1./R                                                  22820
            RETURN                                                         22830
      C                                                                    22840
      C  ERROR RETURNS                                                     22850
         90 IER=K                                                          22860
            RETURN                                                         22870
        100 IER=-1                                                         22880
            RETURN                                                         22890
            END                                                            22900
                                                                           22910
      C                                                                         22920
            SUBROUTINE LBSOL(MDIM,N,M,C,BL,BU,W,X)                              22930
            LEVEL 2,BL,BU                                                       22940
            DIMENSION BL(1),BU(1),W(1),C(N),X(N)                                22950
      C-----------------------------------------------------------------       22960
      C                                                                         22970
      C     SOLUTION OF A*X=C, GIVEN LU DECOMPOSITION OF A FROM LBLU            22980
      C                                                                         22990
      C  REFERENCE.. A. C. HINDMARSH, SOLUTION OF BANDED LINEAR SYSTEMS,        23000
      C  LAWRENCE LIVERMORE LABORATORY REPORT UCID-30045, REV. 1, JUNE 1978.    23010
      C                                                                         23020
      C-----------------------------------------------------------------       23030
      C                                                                         23040
      C     MDIM = DIMENSION PARAMETER FOR BL AND BU.  MDIM.GE.M, MDIM.GE.2.    23050
      C     N    = ORDER OF MATRIX A.  N.GE.2.                                  23060
      C     M    = HALF-BANDWIDTH OF A.  BANDWIDTH = 2*M+1                      23070
      C     BL AND BU CONTAIN THE DECOMPOSITION OF A, AND MUST NOT              23080
      C          HAVE BEEN CHANGED SINCE THE CALL TO LBLU                       23090
      C     C CONTAINS THE RIGHT-HAND SIDE VECTOR.                              23100
      C     W IS AN ARRAY FOR WORKING STORAGE, OF LENGTH AT LEAST M+1           23110
      C     SOLUTION IS STORED IS X.                                            23120
      C     C AND X MAY BE IDENTICAL (C WILL BE OVERWRITTEN).                   23130
      C                                                                         23140
      C     MDIM,N,M,C,BL,BU ARE THE INPUT ARGUMENTS.                           23150
      C     X IS THE OUTPUT ARGUEMENT.                                          23160
      C                                                                         23170
      C-----------------------------------------------------------------       23180
      C                                                                         23190
            N1=N-1                                                              23200
            MIDIM=MDIM+1                                                        23210
            M1=M+1                                                              23220
      C                                                                         23230
      C  LOAD C INTO X.                                                         23240
            DO 5 I=1,N                                                          23250
         5    X(I)=C(I)                                                         23260
            LOC=1-MIDIM                                                         23270
      C                                                                         23280
      C  FORWARD SWEEP.. COPY IN AND APPLY L.                                   23290
            DO 20 J=1,N                                                         23300
              LOC=LOC+MIDIM                                                     23310
              CALL READEC(W,BL(LOC),M1)                                         23320
              X(J)=X(J)*W(1)                                                    23330
              J1=J+1                                                            23340
              I1=MIN0(N,J+M)                                                    23350
            IF(I1.LT.J1) GO TO 20                                               23360
              DO 10 I=J1,I1                                                     23370
        10      X(I)=X(I)-W(I-J+1)*X(J)                                         23380
        20  CONTINUE                                                            23390
      C                                                                         23400
      C  BACKWARD SWEEP.. COPY IN AND APPLY U.                                  23410
            LOC=LOC-N1                                                          23420
            DO 40 I9=1,N1                                                       23430
              I=(N1+1)-I9                                                       23440
              LOC=LOC-MDIM                                                      23450
              CALL READEC(W,BU(LOC),M)                                          23460
              I1=I+1                                                            23470
              JJ=MIN0(N,I+M)                                                    23480
```

```
               DO 30 J=I1,JJ                                                    23490
            30    X(I)=X(I)-W(J-1)*X(J)                                         23500
            40 CONTINUE                                                         23510
      C                                                                         23520
               RETURN                                                           23530
               END                                                              23540
      SUBROUTINE UNCOUP                                                 23550
C                                                                       23560
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         23570
      COMMON /CHEM1/ NMRC(4,99),COEFF(4,99),NMPD(4,99),RK(99),R(99,10)  23580
     1,SRK(99)                                                          23590
      COMMON /CHEM2/ KRXN(99,40),KCOF(99,40),KPRD(4,99),KRCT(4,99)      23600
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           23610
     1,UNCOLD(40,10)                                                    23620
      COMMON /TERMS1/ TEL1(10),TEL2(10),TER1(10),TER2(10),TU1(10)       23630
     1,TU2(10),TDN1(10),TDN2(10),TQ(10),TDR1(10),TDR2(10),TDL1(10)      23640
     2,TDL2(10),TDIVL(10),TDIVR(10),TDIV(10)                            23650
      COMMON /TERMS2/ ENTLAT(40,10),ENTVRT(40,10),DEPOSN(40,10)         23660
     1,SOURCE(40,10),DILUTN(40,10),DIFUSN(40,10),CMSTRY(40,10)          23670
      COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT   23680
      COMMON /RATE1/ Q(10),FHT(10),FR(11),QW,FVDL(10)                   23690
      COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            23700
      COMMON /AMBNT1/ YAML(40),YAMR(40),YAMT(40),IAMSP(40)              23710
      COMMON /GROUND/ VDEP(40),VSORCE(40),YGRND(40)                     23720
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF               23730
      DIMENSION CNEW(40,10)                                             23740
C                                                                       23750
      IF(NUNC.LE.0) RETURN                                              23760
      DO 290 NC=1,NCELLS                                                23770
      DO 290 NU=1,NUNC                                                  23780
      M=NDIF+NSTS+NU                                                    23790
      YUNC=0.0                                                          23800
      DO 270 L=1,NRXN                                                   23810
      J=KCOF(L,M)                                                       23820
      K=KRXN(L,M)                                                       23830
C                                                                       23840
C CALCULATE THE RATE OF CHANGE OF UNCOUPLED SPECIES                     23850
C                                                                       23860
      IF(J) 250,280,260                                                 23870
  250 YUNC=YUNC-R(K,NC)                                                 23880
      GO TO 270                                                         23890
  260 YUNC=YUNC+R(K,NC)*COEFF(J,K)                                      23900
  270 CONTINUE                                                          23910
C                                                                       23920
C TERMS OF DIFFERENTIAL EQUATION                                        23930
C                                                                       23940
  280 IF(KAMBNT.EQ.1) GO TO 330                                         23950
      IF(NC.GT.1) GO TO 322                                             23960
      YP=C(M,NC+1)                                                      23970
      YM=YAML(M)                                                        23980
      GO TO 326                                                         23990
  322 IF(NC.LT.NCELLS) GO TO 324                                        24000
      YP=YAMR(M)                                                        24010
      YM=C(M,NC-1)                                                      24020
      GO TO 326                                                         24030
  324 YP=C(M,NC+1)                                                      24040
      YM=C(M,NC-1)                                                      24050
  326 YT=YAMT(M)                                                        24060
      YG=YGRND(M)                                                       24070
C                                                                       24080
C THE TERMS                                                             24090
C                                                                       24100
      TERMD=YM*TDIVL(NC)+YP*TDIVR(NC)+C(M,NC)*TDIV(NC)                  24110
     1     +YT*QW*FVDL(NC)
      TERM=C(M,NC)*(TEL1(NC)+TER1(NC)+TU1(NC)+TDN1(NC)*VDEP(M)+TQ(NC)
     1         +TDR1(NC)+TDL1(NC))
      TERMM=YM*(TEL2(NC)+TDL2(NC))
      TERMP=YP*(TER2(NC)+TDR2(NC))
      TERMA=YT*TU2(NC)
      TERMC=YC*TDN2(NC)*VSORCE(M)
      TERMCH=YUNC
C
C RATE CHANGE OF Y
C
      YUNC=TERM+TERMM+TERMP+TERMA+TERMC+TERMCH+TERMD
      IF(YUNC.NE.0.) GO TO 328
      ENTLAT(M,NC)=0.0
      ENTVRT(M,NC)=0.0
      DEPOSN(M,NC)=0.0
      SOURCE(M,NC)=0.0
      DILUTN(M,NC)=0.0
      DIFUSN(M,NC)=0.0
      CMSTRY(M,NC)=0.0
      GO TO 330
  328 ENTLAT(M,NC)=(C(M,NC)*(TEL1(NC)+TER1(NC))+YM*TEL2(NC)
     1        +YP*TER2(NC))/YUNC
      ENTVRT(M,NC)=(YT*TU2(NC)+C(M,NC)*TU1(NC))/YUNC
      DEPOSN(M,NC)=C(M,NC)*TDN1(NC)*VDEP(M)/YUNC
      SOURCE(M,NC)=YC*TDN2(NC)*VSORCE(M)/YUNC
      DILUTN(M,NC)=C(M,NC)*TQ(NC)/YUNC
      DIFUSN(M,NC)=(C(M,N)*(TDR1(NC)+TDL1(NC))+YM*TDL2(NC)
     1     +YP*TDR2(NC))/YUNC
      CMSTRY(M,NC)=TERMCH/YUNC
C
  330 CNEW(M,NC)=C(M,NC)+(YUNC+UNCOLD(M,NC))*(TIME-TOLD)*0.5
      UNCOLD(M,NC)=YUNC
  290 CONTINUE
      DO 400 NC=1,NCELLS
      DO 400 NU=1,NUNC
      M=NDIF+NSTS+NU
  400 C(M,NC)=CNEW(M,NC)
      RETURN
      END
```

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BLOCK DATA BLKDAT.     76/76    OPT=1                          FTN 4.6+459        08/10/79  15.54.340      PAGE     1
                         BLOCK DATA
                         COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,     24520
                        1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND         24530
                        2,MAXSTAB                                                                24540
              C                                                                                  24550
                         DATA MAXRCT,MAXPRD,MAXRXN,MAXDIF,MAXSPC/4,4,99,40,50/                   24560
                         DATA MAXPNT,MAXRAD,MAXMIX,MAXKIT,MAXAMB/3*100,20,20/                    24570
                         DATA MAXWND,MAXSTAB/10,10/                                              24580
                         DATA NIN,NOUT,NDISK,JBLANK/5,6,9,1H /                                   24590
                         DATA XCO,XPO/12*1.0/                                                    24600
                         END                                                                     24610
                                                                                                 24620
```

```
      SUBROUTINE INJECT                                                 24630
C                                                                       24640
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF, 24650
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXK1T,MAXAMB,MAXWND    24660
     2,MAXSTAB                                                          24670
      COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT   24680
      COMMON /CONTRL/ HSTART,HMIN,HMAX,EPS,TOL                          24690
      COMMON /AMBNT3/ YAMBIN(40,10),AMBT(10)                            24700
      COMMON /GROUND/ VDEP(40),VSORCE(40),YGRND(40)                     24710
      COMMON /NJECT/ DSTNCE(10),NSPECS(10),NAMESP(10,10),EMRAT1(10,10)  24720
     1,NSORCS,EMRAT2(10,10),TE(11),INJSP(10,10)                         24730
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         24740
      COMMON /PLOTS/ STIMEA(100),STIMEP(100),SPLMC(40,100),SAMBC(40,100) 24750
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           24760
     1,UNCOLD(40,10)                                                    24770
      COMMON /UPDAT/ WIND,FRAD,FMIX,FK1,SIGY,SIGZ                       24780
      COMMON /SPCS/ YY(40),Y(400,6),C(40,10),YAV(40),YIN(40)            24790
      COMMON /GEOM1/ HT(10),W(10),RC(10),RB(11),HAM,HAP                 24800
      COMMON /GEOM2/ RFACC(10),RFACB(11),RADFAC(10),WFAC(10)            24810
      COMMON /TEMPY/ KAMBNT,IPHASE,MCODE,NCL1,NC5,II,HALF               24820
C                                                                       24830
      DATA IFLAG/0/                                                     24840
C                                                                       24850
      DO 10 I=1,NTOT                                                    24860
      VDEP(I)=0.0                                                       24870
   10 VSORCE(I)=0.0                                                     24880
      IF(IFLAG.EQ.1) GO TO 100                                          24890
C                                                                       24900
C     SHOULD EMISSIONS BE INJECTED'                                     24910
C                                                                       24920
      IF(TIME+H.LT.TE(INJCT)) RETURN                                    24930
      H=TE(INJCT)-TIME                                                  24940
      IFLAG=1                                                           24950
      JSTART=-1                                                         24960
      MCODE=1                                                           24970
      RETURN                                                            24980
C                                                                       24990
  100 IFLAG=0                                                           25000
      NSPCS=NSPECS(INJCT)                                               25010
      DO 130 J=1,NSPCS                                                  25020
      I=INJSP(J,INJCT)                                                  25030
C                                                                       25040
C     FOR NOW, ALL CELLS ARE FILLED WITH EMISSIONS IN                   25050
C     GAUSSIAN DISTRIBUTION                                             25060
C                                                                       25070
      DO 120 K=1,NCELLS                                                 25080
      YEMIS=EMRAT2(J,INJCT)/(W(K)*HT(K)*WIND*FLOAT(NCELLS))             25090
      M=(K-1)*NDIF+I                                                    25100
      IF(I.LE.NDIF) Y(M,1)=Y(M,1)+YEMIS                                 25110
      C(I,K)=C(I,K)+YEMIS                                               25120
  120 CONTINUE                                                          25130
  130 CONTINUE                                                          25140
C                                                                       25150
C     OUTPUT NEW CONCENTRATIONS                                         25160
C                                                                       25170
      CALL DEVCON(NTOT,1,YAV,C,NCELLS,WFAC,NFLAG,YIN)                   25180
      II=II+1                                                           25190
```

```
            DO 150 I=1,NTOT                                                   25200
        150 SPLMC(I,II)=YAV(I)                                                25210
            STIMEP(II)=TIME                                                   25220
            CALL OUTPUT(1)                                                    25230
            INJCT=INJCT+1                                                     25240
            JSTART=-1                                                         25250
            MCODE=1                                                           25260
            H=HMIN                                                            25270
      C                                                                       25280
            RETURN                                                            25290
            END                                                               25300
      SUBROUTINE RESULT(II,NAMB)                                        25310
      COMMON /PLOTS/ STIMEA(100),STIMEP(100),SPLMC(40,100),SAMBC(40,100)25320
      COMMON /LOCAL/ NFLAG(40),DUM,YAX(40),NAME(40),STYPE(40)           25330
     1,UNCOLD(40,10)                                                    25340
      COMMON /BLOCKD/ MAXRCT,NIN,NOUT,NDISK,MAXPRD,JBLANK,MAXRXN,MAXDIF,25350
     1MAXSPC,MAXPNT,MAXRAD,MAXMIX,XCO(6),XPO(6),MAXKIT,MAXAMB,MAXWND    25360
     2,MAXSTAB                                                          25370
      COMMON /SINDEX/ IAERS,L1,L2,L4                                    25380
      COMMON /MISC/ XBEG,XEND,TBEG,TEND,IOUT,DCOUNT,DIST(10),KDIST      25390
      COMMON /INTLZ/ TIME,TOLD,FETCH,H,JSTART,NRESET,MHALF,MF,N,INJCT   25400
      COMMON /INPUT4/ MODE1,MODE2,MODE3                                 25410
      COMMON /INPUT1/ NRXN,NDIF,NSTS,NUNC,NINT,NFLW,NTOT,NCELLS         25420
C                                                                       25430
      DIMENSION PLUME(100),AMB(100),AA(99),AP(99),DIF(99),A(99,32)      25440
     1,B(99,32),ZLINE(99),FINALC(3),FINALT(6),ISPEC(40)                 25450
      DIMENSION ZKEY1(25),ZKEY2(25),ZKDIF(25)                           25460
      DATA ZKEY1/1HK,1HE,1HY,1H-,1H ,1H ,1HP,1HL,1HU,1HM,1HE,1H         25470
     1,1HA,1HV,1HG,1H.,1H=,1H ,1H ,1H*,1H*,1H*,1H*,1H*,1H*/             25480
C                                                                       25490
      DATA ZKEY2/9*1H ,1HA,1HM,1HB,1HI,1HE,1HN,1HT,1H=,1H ,1H           25500
     1,1HO,1HO,1HO,1HO,1HO,1HO/                                         25510
C                                                                       25520
      DATA ZKDIF/1H ,1HP,1HL,1HU,1HM,1HE,1H ,1HA,1HV,1HG,1H.,1H         25530
     1,1HM,1HI,1HN,1HU,1HS,1H ,1HA,1HM,1HB,1HI,1HE,1HN,1HT/             25540
C                                                                       25550
      DATA ZLINE/99*1H-/,OOOO/1HO/,STAR/1H*/,BLANK/1H /                 25560
      DATA FINALC/2.0,4.0,8.0/                                          25570
      DATA FINALT/50.0,100.0,200.0,300.0,600.0,900.0/                   25580
      READ(NIN,1000) NSPEC                                              25590
      IF(EOF(NIN)) 600,5,600                                            25600
    5 READ(NIN,1001) (ISPEC(I),I=1,NSPEC)                               25610
 1000 FORMAT(I2)                                                        25620
 1001 FORMAT(16(A4,1X))                                                 25630
C                                                                       25640
C     CHOOSE ABSCISSA AND TIME INTERVAL BASED ON SIMULATION             25650
C     DURATION                                                          25660
C                                                                       25670
      ETIME=AMIN1(TIME,TEND)                                            25680
      IH=1                                                              25690
      IF(ETIME.GT.50.) IH=2                                             25700
      IF(ETIME.GT.100.) IH=3                                            25710
      IF(ETIME.GT.200.) IH=4                                            25720
      IF(ETIME.GT.300.) IH=5                                            25730
      IF(ETIME.GT.600.) IH=6                                            25740
      TINT=FINALT(IH)/99.                                               25750
C                                                                       25760
C     SPECIES LOOP                                                      25770
C                                                                       25780
      DO 500 KSP=1,NSPEC                                                25790
      KFLAG=0                                                           25800
C                                                                       25810
C     IDENTIFY SPECIES NUMBER                                           25820
C                                                                       25830
      DO 10 I=1,NTOT                                                    25840
      IF(ISPEC(KSP).EQ.NAME(I)) GO TO 11                                25850
   10 CONTINUE                                                          25860
   11 IS=I                                                              25870
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      NAM=II
      IF(MODE2.EQ.2) NAM=NAMB
      IF(MODE2.EQ.3) NAM=10
      IF(IS.NE.IAERS) GO TO 14
      DO 12 I=1,NAM
   12 SAMBC(IS,I)=SAMBC(IS,I)*3500.
      DO 13 I=1,II
   13 SPLMC(IS,I)=SPLMC(IS,I)*3500.
C
C     FILL IN LOCAL ARRAYS AND FIND MAXIMA OF PLUME CONCEN-
C     TRATION, AMBIENT CONCENTRATION, AND DIFFERENCE (NOT
C     INCLUDING EMISSIONS EFFECT)
C
   14 ZMAXA=0.0
      ZMAXP=0.0
      ZMAXD=0.0
      DO 15 NL=1,II
      PLUME(NL)=SPLMC(IS,NL)
      IF(PLUME(NL).GT.ZMAXP) ZMAXP=PLUME(NL)
   15 CONTINUE
      DO 18 NA=1,NAM
      AMB(NA)=SAMBC(IS,NA)
      IF(AMB(NA).GT.ZMAXA) ZMAXA=AMB(NA)
   18 CONTINUE
      ZMAX=AMAX1(ZMAXP,ZMAXA)
      IF(NFLAG(IS).EQ.1) ZMAX=ZMAX/2.
C
C     FILL IN 99-ELEMENT ARRAYS BY INTERPOLATION
C
      T=0.0
      DO 25 I=1,99
      AA(I)=0.0
      AP(I)=0.0
      T=T+TINT
      IF(T.GT.STIMEA(NAM)) GO TO 22
      CALL INTERP (T,X,STIMEA,AMB,NAM,1,KFLAG)
      AA(I)=X
   22 IF(T.GT.STIMEP(II)) GO TO 24
      CALL INTERP (T,X,STIMEP,PLUME,II,2,KFLAG)
      AP(I)=X
      DIF(I)=AP(I)-AA(I)
      IF(ABS(DIF(I)).GT.ZMAXD) ZMAXD=ABS(DIF(I))
   24 IF(KFLAG.NE.1) KFLAG=1
   25 CONTINUE
      IF(NFLAG(IS).EQ.1) ZMAXD=ZMAXD/2.
C
C     CHOOSE EXPONENT AND ORDINATE FOR PLOTS
C
      DO 30 J=1,20
      IEX=J-16
      TEST=ZMAX/(10.0**IEX)
      IF(TEST.GT.1.0.AND.TEST.LE.10.0) IEXPA=IEX
      TEST=ZMAXD/(10.0**IEX)
      IF(TEST.GT.1.0.AND.TEST.LE.10.0) IEXPB=IEX
   30 CONTINUE
      IVA=1
      IF(ZMAX.GT.2.0*10.0**IEXPA.AND.ZMAX.LT.8.0*10.0**IEXPA) IVA=2
      IF(ZMAX.GT.4.0*10.0**IEXPA.AND.ZMAX.LT.8.0*10.0**IEXPA) IVA=3         26450
      IF(ZMAX.GE.8.0*10.0**IEXPA) IEXPA=IEXPA+1                             26460
      IVB=1                                                                 26470
      IF(ZMAXD.GT.2.0*10.0**IEXPB.AND.ZMAXD.LT.8.0*10.0**IEXPB) IVB=2       26480
      IF(ZMAXD.GT.4.0*10.0**IEXPB.AND.ZMAXD.LT.8.0*10.0**IEXPB) IVB=3       26490
      IF(ZMAXD.GE.8.0*10.0**IEXPB) IEXPB=IEXPB+1                            26500
C                                                                           26510
C     NOW FILL IN LARGE ARRAYS                                              26520
C                                                                           26530
      DO 100 J=1,32                                                         26540
      DO 100 I=1,99                                                         26550
      A(I,J)=BLANK                                                          26560
      IF(J.GT.15) GO TO 100                                                 26570
      B(I,J)=BLANK                                                          26580
      IF(J.EQ.8) B(I,J)=ZLINE(I)                                            26590
  100 CONTINUE                                                              26600
C                                                                           26610
      AINT=FINALC(IVA)/32.                                                  26620
      AINT2=AINT/2.                                                         26630
      BINT=FINALC(IVB)/7.                                                   26640
      BINT2=BINT/2.                                                         26650
C                                                                           26660
      DO 150 IA=1,32                                                        26670
      I=33-IA                                                               26680
      Z=FLOAT(IA)*AINT                                                      26690
      DO 150 J=1,99                                                         26700
      ZA=AA(J)/10.0**IEXPA                                                  26710
      ZP=AP(J)/10.0**IEXPA                                                  26720
      IF(ZA.GE.Z-AINT2.AND.ZA.LT.Z+AINT2) A(J,I)=OOOO                       26730
      IF(ZP.GE.Z-AINT2.AND.ZP.LT.Z+AINT2) A(J,I)=STAR                       26740
  150 CONTINUE                                                              26750
      DO 160 I=1,15                                                         26760
      IA=8-I                                                                26770
      Z=FLOAT(IA)*BINT                                                      26780
      DO 160 J=1,99                                                         26790
      ZD=DIF(J)/10.0**IEXPB                                                 26800
      IF(ZD.GE.Z-BINT2.AND.ZD.LT.Z+BINT2) B(J,I)=STAR                       26810
  160 CONTINUE                                                              26820
  200 CONTINUE                                                              26830
C                                                                           26840
C     FILL IN REMAINDER OF ARRAYS                                           26850
C                                                                           26860
      DO 170 J=74,98                                                        26870
      A(J,1)=ZKEY1(J-73)                                                    26880
      A(J,2)=ZKEY2(J-73)                                                    26890
  170 B(J,1)=ZKDIF(J-73)                                                    26900
C                                                                           26910
C     CALL PLOT                                                             26920
C                                                                           26930
      ISTEMP=ISPEC(KSP)                                                     26940
      CALL PLOTA(ISTEMP,IEXPA,IEXPB,IVA,IVB,IH,A,B)                         26950
C                                                                           26960
  500 CONTINUE                                                              26970
  600 RETURN                                                                26980
      END                                                                   26990
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            SUBROUTINE PLOTA( ISPCS, IEXPA, IEXPB, IVA, IVB, IH, A, B)              27000
      C                                                                         27010
            DIMENSION VERTA(33,3), VERTB( 17,3)                                 27020
            DIMENSION VLABA(31), VLABB( 17)                                     27030
            DIMENSION A1(31), A2(31), B1( 15), B2( 15)                          27040
            DIMENSION A(99,32), B(99, 15)                                       27050
            DIMENSION HORIZ( 11,6)                                              27060
      C                                                                         27070
            DATA VERTA/4H2.00,3*4H    ,4H1.75,3*4H    ,4H1.50,3*4H              27080
           1,         4H1.25,3*4H    ,4H1.00,3*4H    ,4H0.75,3*4H              27090
           2,         4H0.50,3*4H    ,4H0.25,3*4H    ,4H0.00                    27100
           3,         4H4.00,3*4H    ,4H3.50,3*4H    ,4H3.00,3*4H              27110
           4,         4H2.50,3*4H    ,4H2.00,3*4H    ,4H1.50,3*4H              27120
           5,         4H1.00,3*4H    ,4H0.50,3*4H    ,4H0.00                    27130
           6,         4H8.00,3*4H    ,4H7.00,3*4H    ,4H6.00,3*4H              27140
           7,         4H5.00,3*4H    ,4H4.00,3*4H    ,4H3.00,3*4H              27150
           8,         4H2.00,3*4H    ,4H1.00,3*4H    ,4H0.00/                   27160
      C                                                                         27170
            DATA VERTB/5H 2.00,5H     ,5H 1.50,5H     ,5H 1.00,5H               27180
           1,         5H 0.50,5H     ,5H 0.00,5H     ,5H-0.50,5H               27190
           2,         5H-1.00,5H     ,5H-1.50,5H     ,5H-2.00                   27200
           3,         5H 4.00,5H     ,5H 3.00,5H     ,5H 2.00,5H               27210
           4,         5H 1.00,5H     ,5H 0.00,5H     ,5H-1.00,5H               27220
           5,         5H-2.00,5H     ,5H-3.00,5H     ,5H-4.00                   27230
           6,         5H 8.00,5H     ,5H 6.00,5H     ,5H 4.00,5H               27240
           7,         5H 2.00,5H     ,5H 0.00,5H     ,5H-2.00,5H               27250
           8,         5H-4.00,5H     ,5H-6.00,5H     ,5H-8.00/                  27260
      C                                                                         27270
            DATA VLABA/7*1H ,1HC,1HO,1HN,1HC,1HE,1HN,1HT,1HR,1HA,1HT            27280
           1,         1HI,1HO,1HN,1H ,1HP,1HP,1HM,7*1H /                        27290
      C                                                                         27300
            DATA VLABB/1HC,1HO,1HN,1HC,1HE,1HN,1HT,1HR,1HA,1HT                  27310
           1,         1HI,1HO,1HN,1H ,1HP,1HP,1HM/                              27320
      C                                                                         27330
            DATA A1/3*2H I,2H-I,3*2H I,2H-I,3*2H I,2H-I,3*2H I,2H-I             27340
           1,      3*2H I,2H-I,3*2H I,2H-I,3*2H I,2H-I,3*2H I/                  27350
      C                                                                         27360
            DATA A2/3*2HI ,2HI-,3*2HI ,2HI-,3*2HI ,2HI-,3*2HI ,2HI-             27370
           1,      3*2HI ,2HI-,3*2HI ,2HI-,3*2HI ,2HI-,3*2HI /                  27380
      C                                                                         27390
            DATA B1/2H I,2H-I,2H I,2H-I,2H I,2H-I,2H I,2H-I,2H I,2H-I           27400
           1,      2H I,2H-I,2H I,2H-I,2H I/                                    27410
      C                                                                         27420
            DATA B2/2HI ,2HI-,2HI ,2HI-,2HI ,2HI-,2HI ,2HI-,2HI ,2HI-           27430
           1,      2HI ,2HI-,2HI ,2HI-,2HI /                                    27440
      C                                                                         27450
            DATA HORIZ/3H 0 ,3H 5 ,3H 10,3H 15,3H 20,3H 25,3H 30,3H 35          27460
           1,         3H 40,3H 45,3H 50,3H 0 ,3H 10,3H 20,3H 30,3H 40           27470
           2,         3H 50,3H 60,3H 70,3H 80,3H 90,3H100,3H 0 ,3H 20           27480
           3,         3H 40,3H 60,3H 80,3H100,3H120,3H140,3H160,3H180           27490
           4,         3H200,3H 0 ,3H 30,3H 60,3H 90,3H120,3H150,3H180           27500
           5,         3H210,3H240,3H270,3H300,3H 0 ,3H 60,3H120,3H180           27510
           6,         3H240,3H300,3H360,3H420,3H480,3H540,3H600,3H 0            27520
           7,         3H 90,3H180,3H270,3H360,3H450,3H540,3H630,3H720           27530
           8,         3H810,3H900/                                              27540
      C                                                                         27550
      C                                                                         27560
      DATA NOUT/6/
      IF(ISPCS.EQ.4HAERS) WRITE(NOUT,1011) ISPCS
      IF(ISPCS.NE.4HAERS) WRITE(NOUT,1000) ISPCS
      WRITE(NOUT,1001)
      WRITE(NOUT,1002) IEXPA,VERTA(1,IVA),(A(I,1),I=1,99)
      DO 10 J=1,31
      J1=J+1
   10 WRITE(NOUT,1003) VLABA(J),VERTA(J1,IVA),A1(J),(A(I,J1)
     1,I=1,99),A2(J)
      WRITE(NOUT,1004) VERTA(33,IVA)
      WRITE(NOUT,1005) (HORIZ(I,IH),I=1,11)
      WRITE(NOUT,1006)
      WRITE(NOUT,1007) IEXPB,(HORIZ(I,IH),I=1,11)
      WRITE(NOUT,1008) VERTB(1,IVB)
      DO 20 J=1,15
      J1=J+1
   20 WRITE(NOUT,1009) VLABB(J),VERTB(J1,IVB),B1(J)
     1,(B(I,J),I=1,99),B2(J)
      WRITE(NOUT,1010) VLABB(16),VERTB(17,IVB),VLABB(17)
C
C
 1000 FORMAT(1H1,55X,8HSPECIES-,3X,A4,/56X,15(1H-),/1H0)
 1001 FORMAT(3X,9HALL UNITS,9X,1HI,99(1H-),1HI)
 1002 FORMAT(2X,7H(X 1.0E,I3,3H)   ,A4,1X,2H-I,99A1,2HI-)
 1003 FORMAT(5X,A1,9X,A4,1X,A2,99A1,A2)
 1004 FORMAT(15X,A4,1X,2H-I,10(9(1H-),1HI),1H-)
 1005 FORMAT(20X,10(A3,7X),A3)
 1006 FORMAT(1H0,60X,10HTIME (MIN),/3X,9HALL UNITS)
 1007 FORMAT(2X,7H(X 1.0E,I3,1H),7X,10(A3,7X),A3)
 1008 FORMAT(14X,A5,1X,1H-,10(1HI,9(1H-)),2HI-)
 1009 FORMAT(5X,A1,8X,A5,1X,A2,99A1,A2)
 1010 FORMAT(5X,A1,8X,A5,1X,1H-,10(1HI,9(1H-)),2HI-,/5X,A1)
 1011 FORMAT(1H1,55X,8HSPECIES-,3X,A4,4X,21HUNITS IN MICRO-G/M**3
     1,/56X,15(1H-),/1H0)
      END
```